KING CITY
CALIFORNIA

Item No. **10 (A)**

REPORT TO THE CITY COUNCIL

DATE: SEPTEMBER 13, 2016

TO: HONORABLE MAYOR AND MEMBERS OF THE CITY COUNCIL

FROM: DOREEN LIBERTO BLANCK, COMMUNITY DEVELOPMENT DIRECTOR

BY: SCOTT BRUCE, PRINCIPAL PLANNER

RE: CONSIDERATION OF FIRST READING RE: AMENDING THE KING CITY MUNICIPAL CODE - REPEALING AND REPLACING SECTION 17.03; AMENDING SECTIONS 17.30.020 AND 17.31.020; AMENDING THE EAST RANCH BUSINESS PARK SPECIFIC PLAN; ADOPTION OF RELATED ENVIRONMENTAL DOCUMENT

RECOMMENDATION:

Staff recommends that City Council: 1) review and consider proposed Ordinances and Environmental Document; 2) Conduct Pubic Hearing, Including First Reading of Ordinance(s) by Title; 3) provide Staff with any comment for revision to proposed Ordinances; 4) review and consider regarding the related Environmental Document (MND); and 5) Schedule Second Reading / Council Action.

BACKGROUND:

Newly adopted State Law created the Medical Marijuana Regulation and Safety Act, which put into effect a State regulatory structure for cultivation, distribution, manufacturing and transportation of medical cannabis.

On January 26, 2016, the City Council *("Council")* adopted revisions to the Municipal Code, which allowed indoor Medical Cannabis Cultivation under artificial light. The Council also considered and adopted the Mitigated Negative Declaration *("MND")* related to the project.

As noted above, the existing Municipal Code limits allowed indoor cultivation to the use of artificial light. The current repeal and replacement of Title 17, Section 17.03 would guide and direct the review, oversight and approval of additional indoor cultivation uses,

nurseries, manufacturing and testing. It would also provide specific definition and regulation of Medical Cannabis related operations.

Amendment to Title 17, Section 17.03 defines and regulates the Medical Cannabis related uses that are to be allowed in the City; it does not specifically delineate those additional uses and / or the areas of the City where those uses can be located. Currently, the ERBP and the M-1, M-2 Districts allow indoor cultivation under artificial light.

Amendment to Title 17, Sections 17.30.020 and 17.31.020 and the ERBP Specific Plan will allow the additional land uses / licenses in the M-1 and M-2 Districts and the ERBP.

At the August 23, 2016 meeting, the City Council reviewed draft ordinances and provided staff direction on issues that were identified. Staff has incorporated those changes.

At the September 6, 1016 meeting, the Planning Commission met to consider the proposed Ordinances and the Environmental Document and, to provide recommendation. Resolution 2016-158 expressing that recommendation is provided as Exhibit 5.

DISCUSSION:

As noted above, Ordinance 2016 - 728 repealing and replacing Section 17.03 (Regulatory Ordinance) will define, regulate and direct the establishment, approval and monitoring of allowed Medical Cannabis uses in the City. This Ordinance does not identify specifically allowed uses in the City or identify their allowed locations. An annual permit and fee would be required, which would be used to cover the cost of annual inspections.

Ordinance 2016 - 729 amends Sections 17.30.020 and 17.31.020, adding allowed Medical Cannabis related uses to the M-1 and M-2 Districts. The M-3 District is included by virtue of the fact that all uses allowed in the M-1 and M-2 Districts are allowed in the M-3 District.

Ordinance 2016 - 730 amends the ERBP Specific Plan, adding allowed Medical Cannabis related uses in the ERBP.

The IS / MND assesses the potential environmental impacts and identifies appropriate mitigation measures associated with the proposed (expanded) commercial cultivation,

manufacturing and testing of Medical Cannabis in the M-1, M-2, M-3 and East Ranch Business Park portions of the City.

The State of California, as part of AB 243, AB 266 and SB 643, has defined certain Types of "Licenses". The City's Municipal Code currently allows:

- Type 2A: Indoor cultivation with all artificial light from 0 to 10,000 square feet of plant canopy
- Type 3A: Indoor cultivation with all artificial light from 10,001 to 22,000 square feet of plant canopy

Ultimately, the Amendments to the City Code will expand allowed uses in the ERBP and the M-1, M-2 Districts to add / include:

- Type 2B: Indoor cultivation with all artificial light from 0 to 10,000 square feet of plant canopy
- Type 3B: Indoor cultivation with all artificial light from 10,001 to 22,000 square feet of plant canopy
- Type 4: Nurseries (the City anticipates limiting this use to a maximum 25,000 sf of plant growth area).
- Type 6: Manufacturing (Level 1)
- Type 8: Testing

The Ordinance also includes a total restriction on cultivation and nursery facilities up to a maximum of 1,350,000 square feet. Manufacturing licenses are limited to a maximum of 6.

At the last meeting, Council Member Acosta requested additional information on hazards of CO2. Information obtained by staff is included in Exhibit 7.

Amendment of the Municipal Code allowing for the cultivation, manufacture and testing of cannabis in the City limits is considered a project under CEQA. An Initial Study (IS) leading to a Mitigated Negative Declaration (MND) was completed and has been available for public review beginning Wednesday August 17.

To prepare the IS, the scope of the potential Medical Cannabis related development was estimated based on best information available from Staff research and comment by potential applicants. Based on the findings of the IS an MND was prepared.

The MND evaluated impacts based upon the estimated potential impacts of the proposed additional uses. During the preparation of the MND, PG&E, CalWater, Mott MacDonald Traffic Engineers and the City's Public Works Department were consulted.

On September 6, 2016 the Planning Commission met to discuss the item and make recommendation. Staff presented revisions to the Ordinances as presented in the Staff Report. Those included:

- **Section 17.03. 090**: 600' separation from schools. Staff explained that a recent Notice of Preparation for a Program EIR related to State Regulations for the Medical Cannabis Cultivation Program indicated (Outline of Draft Regulations) that Applicants for Cultivation Licenses would need to "attest" that the "... proposed location is located beyond a 600-foot radius from a school." Staff noted that this language may be an indicator of the State's position on separation and recommended a corresponding change to the Ordinance. Staff originally recommended no separation requirement, but has attempted to maintain the local restrictions as consistent with the State as possible. This change is currently limited to cultivation so Council direction would be necessary if there is a desire to expand it to include manufacturing.

- **Sections 17.03 220. 250 and 270:** Use of food grade alcohol to be allowed "...solely for the purposes of cleaning machinery and dissolving wax, unless otherwise prohibited by the State of California."

- **Title of Ordinance 2016-729:** Added "Manufacturing"

- **Ordinance 2016-729 (M-1 and M-2 Districts):**
  - Section 1: Add "Commercial *Medical* Cannabis Activity
  - Section 2: Add "Commercial *Medical* Cannabis Cultivation
  - Section 6: Add " ... is hereby repealed *and replaced* as follows:
  - Section 6: Add a) *All Commercial Cannabis activity shall be subject to and comply with all provisions of the King City Municipal Code Chapter 17.03.*
  - Section 9: Add a) *All Commercial Cannabis activity shall be subject to and comply ith all provisions of the King City Municipal Code Chapter 17.03.*

At that meeting the Commission questioned Staff and received comment from the public. A summary (from Staff notes) is attached as **Exhibit 6.**

The Commission took action regarding Resolution 2016 – 158, recommending *approval* of the Ordinances and Certification of the MND in a 5-0 vote.

COST ANALYSIS:

There is no additional cost associated with approval at this time. There will be costs associated with enforcement of provisions within the regulatory ordinance, but a fee will be established to address most those costs.

ALTERNATIVES:

The following alternatives are provided for Council consideration:

1. Introduce Ordinances 2016-728, 2016-729 and 2016-730 and consider and Certify the Initial Study / Mitigated Negative Declaration;
2. Make a modification to include a separation requirement from schools for manufacturing in addition to cultivation and introduce;
3. Direct staff to make other modifications to the Ordinances;
4. Do not introduce the Ordinances; or
5. Provide other direction to staff.

Exhibits:

1. Ordinance No. 2016 - 728 (Section 17.03, Regulatory Ordinance)
2. Ordinance No. 2016 – 729 (Sections 17.30 and 17.31 (M-1 and M-2 Districts)
3. Ordinance No. 2016 – 730 (East Ranch Business Park Specific Plan Amendment).
4. IS / MND
5. Planning Commission Resolution No. 2016 – 158
6. Comments from Planning Commission hearing
7. CO2 Potential Hazards Information

Prepared by: EL for Scott Bruce
Scott Bruce, Principal Planner

Submitted by: E Sonne for Doreen Liberto-Blanck
Doreen Liberto-Blanck, AICP, Community Development Director

Approved by: _____
Steven Adams, City Manager

Attachment 1

ORDINANCE No. 2016-728

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF KING REPEALING CHAPTER 17.03, TITLE 17, ZONING, AND REPLACING CHAPTER 17.03, TITLE 17 OF THE CITY OF KING MUNICIPAL CODE TO ALLOW THE ESTABLISHMENT, OPERATION AND REGULATIONS OF COMMERCIAL CANNABIS BUSINESSES FOR THE CULTIVATION, MANUFACTURING, AND TESTING OF MEDICAL MARIJUANA AND MEDICAL MARIJUANA PRODUCTS

WHEREAS, the City of King is a charter city organized pursuant to Article XI of the California Constitution; and

WHEREAS, pursuant to the authority granted the City by Article XI, Section 7 of the California Constitution, the City has the police power to adopt regulations designed to promote the public convenience or the general prosperity, as well as regulations designed to promote the public health, the public morals or public safety; and

WHEREAS, comprehensive zoning regulations and regulations upon the use of land and property lie within the City's police power; and

WHEREAS, the Federal Controlled Substances Act, 21 U.S.C. Sections 801 et seq. classifies marijuana as a Schedule 1 Drug and makes it unlawful, under federal law, for any person to cultivate, manufacture, distribute, dispense, or possess with intent to manufacture, distribute or dispense, marijuana; and

WHEREAS, the Federal Controlled Substances Act contains no exemption for the cultivation, manufacture, distribution, dispensation or possession of marijuana for medicinal purposes; and

WHEREAS, notwithstanding federal law, in 1996, the voters of the State of California approved Proposition 215 (codified as California Health and Safety Code Section 11362.5 and titled the "Compassionate Use Act of 1996"), the intent of Proposition 215 being to enable persons who are in need of marijuana for medical purposes to be able to obtain and use it without fear of state criminal prosecution under limited, specified circumstances; and

WHEREAS, in 2004, Senate Bill 420 was enacted (codified as California Health and Safety Code Section 11362.7 et seq. and titled the "Medical Marijuana Program Act" to clarify the scope of the Compassionate Use Act of 1996 ("CUA"); and

WHEREAS, the Medical Marijuana Program Act ("MMPA") promulgates rules wherein counties and cities can adopt and enforce rules and regulations consistent with its provisions; and

WHEREAS, in 2011, Assembly Bill 2650 was enacted (codified as California Health and Safety Code Section 11362.768) affirming that counties and cities can under state law adopt

ordinances that control and restrict the location and establishment of a medical marijuana cooperative, collective, dispensary, operator, establishment, or provider; and

WHEREAS, the California Supreme Court held in *City of Riverside v. Inland Empire Patients Health and Wellness Center, Inc.* (2013) 56 Cal. 4th 729, 753 ("*Inland Empire*") that the objectives of the CUA and MMPA were modest and that those acts did not create a broad right to access medical marijuana, and *Inland Empire* goes on to provide that neither the CUA nor the MMPA "expressly or impliedly preempts the authority of California cities and counties, under their traditional land use and police powers, to allow, restrict, limit, or entirely exclude" the distribution of medical marijuana. (Id. At p. 762.); and

WHEREAS, the Court of Appeal, Third Appellate District, held in *James Maral, et al. v. City of Live Oak* (2013) 221 Cal.App.4th 975, that the reasoning of *Inland Empire* applies to the cultivation of medical marijuana as well as its distribution, as both are addressed in the CUA and the MMPA; and

WHEREAS, on October 9, 2015, Governor Jerry Brown signed the "Medical Marijuana Regulation And Safety Act" ("MMRSA") into law; and

WHEREAS, the MMRSA, which is comprised of three separate pieces of legislation, establishes, among other matters, a dual licensing structure requiring both a state license and a local license or permit for medical marijuana activities, a regulatory structure imposing health, safety and testing standards for cultivation and dispensary facilities, and the criteria for licensing medical marijuana businesses; and

WHEREAS, neither the Compassionate Use Act, the Medical Marijuana Program, nor the Medical Marijuana Regulation and Safety Act require or impose an affirmative duty or mandate upon local governments to allow, authorize or sanction the establishment and the operation of facilities for distribution, cultivation, manufacturing or processing medical marijuana within its jurisdiction, and

WHEREAS, notwithstanding the comprehensive nature of the MMRSA, the Act under state law protects the ability of local entities to maintain control over medical marijuana activities; and

WHEREAS, the City Council desires to establish reasonable land use controls and reasonable regulations on the operation of medical marijuana-related businesses which are intended to operate in conjunction with the City of King Zoning Code's land use regulation and which are intended to address the negative impacts and nuisance impacts of marijuana-related businesses; and

WHEREAS, medical marijuana-related businesses will be subject to the zoning and land use regulations of the zoning district in which such business establish and operate, as set forth in Title 17 of the City of King Municipal Code (the King City Zoning Code); and

WHEREAS, mindful of the fact that marijuana possession and use is prohibited under federal law and partially decriminalized under state law, it is the Council's intention that nothing in this ordinance shall be construed, in any way, to expand the rights of anyone to use or possess marijuana under state law; engage in any public nuisance; violate federal law, or engage in any activity in relation to the cultivation, distribution, or consumption of marijuana that is otherwise illegal. It is further the intent of the City Council of City of King to maintain local control over these matters to the fullest extent permitted by law.

NOW THEREFORE, BE IT HEREBY ORDAINED BY THE CITY COUNCIL OF THE CITY OF KING AS FOLLOWS:

SECTION 1. Title 17 (Zoning), Chapter 17.03 (Medical Marijuana Dispensaries) is repealed in its entirety and replaced with the following:

Chapter 17.03 Medical Cannabis Activity

17.03.010	Purpose and Intent.
17.03.020	Definitions
17.03.030	Non-commercial Cannabis Activity prohibited in any zone.
17.03.040	Licenses and Permits
17.03.050	Existing Commercial Cannabis Businesses
17.03.060	Security Measures
17.03.070	Employees; Employee Work Permits; Identification
17.03.080	Right to Occupy and to Use Property
17.03.090	Location of Commercial Cannabis Business; Proximity to Sensitive Uses
17.03.100	Restriction on Alcohol Sales
17.03.110	Concurrent Regulation with State
17.03.120	Compliance with Laws
17.03.130	Inspection and Enforcement
17.03.140	Fees and Charges
17.03.150	Violation and Enforcement
17.03.160	Limitations on City's Liability
17.03.170	Application Procedures and Application Requirements
17.03.180	Records and Reporting
17.03.190	Prohibition on Transfer of Commercial Cannabis Permits
17.03.200	Packaging and Labelling
17.03.210	Operating Requirements
17.03.220	Cultivation, Manufacturing, Waste, and Storage Requirements
17.03.230	Limitation on the Number of Cultivation and Nursery Facilities
17.03.240	Periodic Review by the City Council
17.03.250	Operating Requirements for Cultivation and Nurseries
17.03.260	Cannabis Manufacturing; Edibles and Other Cannabis Products; Sale or Distribution of Edible and Other Cannabis Products
17.03.270	Cannabis Manufacturing: Extraction, etc.
17.03.280	Promulgation of Regulations and Standards
17.03.290	Community Relations

17.03.300 Fees Deemed Debt to City of King
17.03.310 Permit Holder Responsible for Violations

17.03.010 **Purpose and Intent.**

(a) It is the purpose and intent of this Chapter to accommodate the needs of medically-ill persons in need of marijuana for medical purposes while imposing regulations on the use of land to protect City of King's neighborhoods, residents, and businesses from negative impacts. It is a further purpose and intent of this Chapter to regulate the, cultivation, manufacturing and testing of cannabis and cannabis-related products in a manner which is responsible and which protects the health, safety, and welfare of the residents of the City of King; to enforce rules and regulations consistent with State law including, but not limited to, the Compassionate Use Act, the Medical Marijuana Program Act, and the Medical Marijuana Regulation and Safety Act. In part to meet these objectives, an annual permit shall be required in order to own and to operate a commercial cannabis business within the City of King as authorized under this ordinance or within the City of King Zoning Ordinances. Nothing in this Chapter is intended to authorize the cultivation, possession or use of marijuana for non-medical purposes in violation of State or Federal law. The provisions of this Chapter are in addition to the business license otherwise required to conduct business in the City of King and in addition to permits and approvals otherwise required.

(b) Pursuant to Section 7 of Article XI of the California Constitution, the City of King is authorized to adopt ordinances that establish standards, requirements, and regulations for local licenses and permits for commercial cannabis activity. Any standards, requirements, and regulations regarding health and safety, testing, laboratory operations and safety, security, and worker protections established by the State of California, or any of its departments or divisions, shall be the minimum standards applicable in the City of King to commercial cannabis activity.

17.03.020 **Definitions**

When used in this Chapter, the following words shall have the meanings ascribed to them in this section. Any reference to California statutes includes any regulations promulgated thereunder and is deemed to include any successor or amended version of the referenced statute or regulatory provision.

(a) "Cannabis" means all parts of the Cannabis sativa Linnaeus, Cannabis indica, or Cannabis ruderalis, whether growing or not; the seeds thereof; the resin, whether crude or purified, extracted from any part of the plant; and every compound, manufacture, salt, derivative, mixture, or preparation of the plant, its seeds, or resin. "Cannabis" also means the separated resin, whether crude or purified, obtained from marijuana. "Cannabis" also means marijuana as defined by Section 11018 of the California Health and Safety Code as enacted by Chapter 14017 of the Statutes of 1972. "Cannabis" does not include the mature stalks of the plant, fiber produced from the stalks, oil or cake made from the seeds of the plant, any other compound, manufacture, salt, derivative, mixture, or preparation of the mature stalks (except the resin extracted therefrom), fiber, oil, or cake, or the sterilized seed of the plant which

is incapable of germination. For the purpose of this Chapter, "cannabis" does not mean industrial hemp as that term is defined by Section 81000 of the California Food and Agricultural Code or Section 11018.5 of the California Health and Safety Code.

(b) "Cannabis concentrate" means manufactured cannabis that has undergone a process to concentrate the cannabinoid active ingredient, thereby increasing the product's potency. An edible medical cannabis product is not considered food, as defined by Section 109935 of the California Health and Safety Code, or a drug, as defined by Section 109925 of the California Health and Safety Code.

(c) "Caregiver" or "primary caregiver" has the same meaning as that term is defined in Section 11362.7 of the California Health and Safety Code.

(d) "Commercial cannabis activity" includes cultivation, nursery, possession, manufacture, processing, storing, laboratory testing, labeling, transporting, or sale of medical cannabis or a medical cannabis product, except as set forth in California Business and Professions Code Section 19319, related to qualifying patients and primary caregivers.

(e) "Commercial cannabis business" means any business or operation which engages in commercial cannabis activity.

(f) "Commercial cannabis permit" means a permit issued by the City of King pursuant to this Chapter to a commercial cannabis business.

(g) "Cultivation" means any activity involving the propagation, planting, growing, harvesting, drying, curing, grading, or trimming of cannabis.

(h) "Cultivation site" means a facility where medical cannabis is propagated, planted, grown, harvested, dried, cured, graded, or trimmed, or that does all or any combination of those activities, that holds a valid state license pursuant to the Medical Marijuana Regulation and Safety Act and that holds a permit issued by the City of King.

(i) "Delivery" means the commercial transfer of medical cannabis or medical cannabis products from a dispensary, up to an amount determined by the State of California, or any of its departments or divisions, to a primary caregiver or qualified patient, or a testing laboratory. "Delivery" also includes the use by a dispensary of any technology platform owned and controlled by the dispensary, or independently licensed by the State of California under Medical Marijuana Regulation and Safety Act (as the same may be amended from time-to-time), that enables qualified patients or primary caregivers to arrange for or facilitate the commercial transfer by a licensed dispensary of medical cannabis or medical cannabis products.

(j) "Dispensary" means a facility where cannabis, medical cannabis products, or devices for the use of medical cannabis or medical cannabis products are offered, either individually or in any combination, for retail sale, including an establishment (whether fixed or mobile) that delivers, pursuant to express authorization, medical cannabis and medical cannabis products as part of a retail sale.

(k) "Dispensing" means any activity involving the retail sale of medical cannabis or medical cannabis products from a dispensary.

(l) "Distribution" means the procurement, sale, and transport of medical cannabis or medical cannabis products between entities licensed pursuant to the Medical Marijuana Regulation and Safety Act and any subsequent State of California legislation regarding the same.

(m) "Distributor" means a person licensed under the Medical Marijuana Regulation and Safety Act and any subsequent State of California legislation to engage in the business of purchasing medical cannabis from a licensed cultivator, or medical cannabis products from a license manufacturer, for sale to a licensed dispensary.

(n) "Dried flower" means all dead medical cannabis that has been harvested, dried, cured, or otherwise processed, excluding leaves and stems.

(o) "Edible cannabis product" means manufactured cannabis that is intended to be used, in whole or in part, for human consumption. An edible medical cannabis product is not considered food as defined by Section 109935 of the California Health and Safety Code or a drug as defined by Section 109925 of the California Health and Safety Code.

(p) "License" means the issuing of a license by the State of California, or one of its departments or divisions, under the Medical Marijuana Regulation and Safety Act to engage in commercial cannabis activity.

(q) "Live plants" means living medical cannabis flowers and plants, including seeds, sprouts, immature plants (including unrooted clones), and vegetative stage plants.

(r) "Manufacturer" means a person that conducts the production, preparation, propagation, or compounding of manufactured medical cannabis, as defined in this section, or medical cannabis products either directly or indirectly or by extraction methods, or independently by means of chemical synthesis at a fixed location that packages or repackages medical cannabis or medical cannabis products or labels or relabels its container, that holds a valid state license pursuant to the Medical

Marijuana Regulation and Safety Act and that holds a permit issued by the City of King.

(s) "Manufactured cannabis" means raw cannabis that has undergone a process whereby the raw agricultural product has been transformed into a concentrate or manufactured product intended for internal consumption or topical application.

(t) "Manufacturing site" means a location that produces, prepares, propagates, or compounds medical cannabis or medical cannabis products, directly or indirectly, by extraction methods, independently by means of chemical synthesis, or by a combination of extraction and chemical synthesis, and is owned and operated by a person issued a license by the State of California, or one of its departments or divisions, for these activities.

(u) "Medical cannabis", "medical cannabis product," or "cannabis product" means a product containing cannabis, including, but not limited to, concentrates and extractions, intended to be sold for use by medical cannabis patients in California pursuant to the Compassionate Use Act of 1996 (Proposition 215), found at Section 11362.5 of the California Health and Safety Code (as the same may be amended from time-to-time). For purposes of this Chapter, "medical cannabis" does not include industrial hemp as defined by Section 81000 of the California Food and Agricultural Code or Section 11018.5 of the California Health and Safety Code.

(v) "Nursery" means a licensee that produces only clones, immature plants, seeds, and other agricultural products used specifically for the planting, propagation, and cultivation of medical cannabis.

(w) "Patient" or "qualified patient" shall have the meaning given that term by California Health and Safety Code Section 11362.7, but who does not have an identification card issued by the State Department of Health Services.

(x) "Person" means an individual, firm, partnership, joint venture, association, corporation, limited liability company, estate, trust, business trust, receiver, syndicate, or any other group or combination acting as a unit and includes the plural as well as the singular number.

(y) "Topical cannabis" means a product intended for external use. A topical cannabis product is not considered a drug as defined by Section 109925 of the California Health and Safety Code.

(z) "Transport" means the transfer of medical cannabis or medical cannabis products from the permitted business location of one licensee to the permitted business

location of another licensee, for the purposes of conducting commercial cannabis activity authorized by the Medical Marijuana Regulation and Safety Act.

(aa) Transporter" means a person issued a state license by the State of California, or one of its departments or divisions, to transport medical cannabis or medical cannabis products in an amount above a threshold determined by the State of California, or one of its departments or divisions, that have been issued a State license pursuant to the Medical Marijuana Regulation and Safety Act.

17.03.030 **Non-commercial Cannabis Activity prohibited in any zone.**

Notwithstanding anything to the contrary contained in the King City Municipal Code, activity other than Commercial Cannabis activity shall not be a permitted use in any zone of the city, and no conditional use permit shall be issued permitting such use. Further notwithstanding anything contrary contained in the King City Municipal Code, a violation of this chapter and or any provision thereof shall not be subject to criminal penalties but may only be enforced by civil and or administrative proceedings.

17.03.040 **Licenses and Permits**

(a) In addition to those other requirements which may be imposed pursuant to this Chapter, no person shall engage in commercial cannabis activity or open or operate a commercial cannabis business without possessing both a commercial cannabis permit issued by the City Manager or his/her designee and within one (1) year of the ability to obtain a license from the State of California upon implementation of the Medical Marijuana Regulation and Safety Act, a license issued by the State of California or one of its departments or divisions. Commercial cannabis activity shall be permitted in the City of King only as expressly provided in this Chapter and if not expressly permitted by this Chapter shall be prohibited.

(1) Each commercial cannabis business permit issued pursuant to this Chapter shall expire twelve (12) months after the date of its issuance.

(2) An application for renewal of a commercial cannabis permit shall be filed at least sixty (60) calendar days prior to the expiration date of the permit with the City Manager or his/her designee.

(3) An application for renewal of a commercial cannabis permit shall be rejected if any of the following exists:

a. The application is filed less than sixty (60) days before its expiration.
b. The commercial cannabis permit is suspended or revoked at the time of the application.

c. The commercial cannabis business has not been in regular and continuous operation in the four (4) months prior to the renewal application.
d. The commercial cannabis business fails to conform to the requirements of this Chapter, any regulations adopted pursuant to this Chapter or the conditions imposed as part of any conditional use permit or zoning requirements.
e. The permittee fails to renew its State of California license.

(4) If a renewal application is rejected, a person may file a new application pursuant to this Chapter.

(5) Applicants seeking multiple licenses for different types of cannabis activity shall be required to comply with multiple licensing restrictions contained within Business and Professions Code §19328.

(b) Prior to commencing operation, a commercial cannabis business shall obtain a City of King business license and comply with all applicable provisions and requirements of that license.

(c) Prior to commencing operation, a commercial cannabis business shall be subject to a mandatory building inspection and must obtain all required permits or approvals which would otherwise be required including, but not limited to, a building permit(s), King Fire Department permit(s), and planning-level permit(s) required by Title 17 Zoning of the City of King Municipal Code.

(d) Revocation, termination, non-issuance or suspension of a license issued by the State of California, or any of its departments or divisions, shall immediately terminate the ability of a medical cannabis business to operate within the City of King until the State of California, or its respective department or division, reinstates or issues the State license.

17.03.050 **Existing Commercial Cannabis Businesses.**

A commercial cannabis business operating in compliance with existing Municipal Code provisions at the time this Chapter becomes effective may continue its current operations; provided, however, that in order to continue operating such commercial cannabis business must apply for a commercial cannabis permit pursuant to this Chapter and otherwise meet all other conditions and requirements of this Chapter imposed on newly established commercial cannabis businesses. Any facility or entity that can demonstrate to the City's satisfaction prior to the adoption of the ordinance establishing this Chapter that it was in operation, in good standing, and otherwise in compliance with all applicable local and state laws and regulations promulgated thereunder may be permitted to continue its current operations pursuant to this section.

17.03.060 **Security Measures.**

The City Manager or his/her designee is authorized to promulgate all regulations necessary to implement the requirements and fulfill the policies of this Chapter related to commercial cannabis businesses including, but not limited to, the following subjects:

(a) A permitted commercial cannabis business shall implement sufficient security measures to both deter and to prevent unauthorized entrance into areas containing medical cannabis or medical cannabis products and theft of medical cannabis or medical cannabis products at the commercial cannabis business. Except as may otherwise be determined by the City Manager or his/her designee, these security measures shall include, but shall not be limited to, all of the following:

(1) Preventing individuals from remaining on the premises of the commercial cannabis business if they are not engaging in the activity expressly related to the operations of the commercial cannabis business.

(2) Establishing limited access areas accessible only to authorized commercial cannabis business personnel.

(3) Except for live growing plants which are being cultivated at a cultivation facility, all medical cannabis and medical cannabis products shall be stored in a secured and locked room, safe, or vault. All medical cannabis and medical cannabis products, including live plants which are being cultivated, shall be kept in a manner as to prevent diversion, theft, and loss, except for limited amounts of cannabis used for display purposes or immediate sale at a dispensary.

(4) Installing 24-hour security surveillance cameras of at least HD-quality to monitor all entrances and exits to and from the premises and to monitor all interior spaces within the commercial cannabis business which are open and accessible to the public. The security surveillance cameras shall be remotely accessible to the King Police Department and shall be compatible with the King Police Department's software and hardware and remote real-time, live access to the video footage from the cameras shall be provided to the King Police Department. Video recordings shall be maintained for a minimum of forty-five (45) days.

(5) Sensors shall be installed to detect entry and exit from all secure areas.

(6) Panic buttons shall be installed in all commercial cannabis businesses.

(7) Having a professionally installed, maintained, and monitored alarm system.

(8) Any bars installed on the windows or the doors of the commercial cannabis business shall be installed only on the interior of the building.

(9) Security personnel hired by the commercial cannabis business shall be subject to the prior review and approval of the Chief of Police or his/her designee.

(10) Each commercial cannabis business shall have the capability to remain secure and operational during a power outage and shall ensure that all access doors are not solely controlled by an electronic access panel to ensure that locks are not released during a power outage.

(b) Each commercial cannabis business shall identify a liaison to the King Police Department who shall be reasonably available to meet with the Chief of Police or his designees regarding security measures and operational issues.

(c) As part of the application and permitting process, each commercial cannabis business shall have a transportation plan describing the procedures for safely and securely transporting cannabis and cannabis products and currency.

(d) A commercial cannabis business shall notify the Chief of Police within twenty-four (24) hours after discovering any of the following:

(1) Significant discrepancies identified during inventory. The level of significance shall be determined by the regulations promulgated by the City Manager or his/her designee.

(2) Diversion, theft, loss, or any criminal activity involving the commercial cannabis business or any agent or employee of the commercial cannabis business.

(3) The loss or unauthorized alteration of records related to cannabis, registering qualifying patients, primary caregivers, or employees or agents of the commercial cannabis business.

(4) Any other breach of security.

17.03.070 **Employees; Employee Work Permits; Identification**

(a) Work permit required. Any person who is an employee or who otherwise works or volunteers within a commercial cannabis business must obtain a work permit from the City Manager or his/her designee. The City Manager or his/her designee is hereby authorized to promulgate all regulations necessary to implement the work permit process contemplated in this section including, but not limited to, the reasons for denial of a work permit to any person. A work permit shall be valid for a twelve (12) month period and must be renewed on an annual basis. Applications for work permits shall be submitted under oath and shall contain a statement of the past criminal record, if any, of the applicant and such information as may be deemed necessary by the City Manager or

his/her designee to determine whether the applicant is a proper person to be issued a work permit. The application shall be accompanied by fingerprints and a recent photograph of the applicant in a form and manner as required by the City Manager or his/her designee. In the event a person changes employment from one commercial cannabis business within the city to another, the work permit holder shall notify the City Manager or his/her designee in writing of the change of employment within ten (10) days of such change or the work permit shall be suspended or revoked and such person shall not be permitted to work within any commercial cannabis business within the city.

(b) Identification. Each person to whom a work permit is issued shall wear his or her personal identification card, issued by the City of King, at a prominent and readily-visible location on the outermost garment and approximately chest-high. Such identification card shall at all times be in good and readable condition.

(c) Employee Records. Each owner or operator of a commercial cannabis business shall maintain on-site a current register of all the employees currently employed by the commercial cannabis business and shall produce such register to the City Manager or his/her designee or any other City of King official authorized to enforce the King City Code for purposes of determining compliance with this Chapter.

(d) Fees. Each application for a work permit and renewal of an existing work permit shall be accompanied by a fee set by resolution of the City Council and shall be valid for a period of twelve (12) months from the date of issuance, unless terminated, suspended, or revoked sooner. The fee is non-refundable and shall not be returned in the event the work permit is denied, revoked, or suspended.

17.03.080 **Right to Occupy and to Use Property.**

As a condition precedent to the City's issuance of a commercial cannabis permit pursuant to this Chapter, any person intending to open and to operate a commercial cannabis business shall provide sufficient evidence of the legal right to occupy and to use the proposed location. In the event the proposed location is leased from another person, the applicant for a permit under this Chapter shall provide a signed and notarized statement from the owner of the property to demonstrate the property owner has acknowledged and has consented to the operation of a commercial cannabis business on the property.

17.03.090 **Location of Commercial Cannabis Business; Proximity to Sensitive Uses.**

(a) No commercial cannabis business may operate within any wholly residential area or district of the city or adjacent to a residential area or district if, in the opinion of City Manager or his/her designee, the operation of a commercial cannabis business in such location would tend to cause a public nuisance or a situation which may result in repeated Police Department response or a negative impact on the adjacent residential units.

(b) Commercial cannabis businesses shall be required to comply with all zoning, land use, and development regulations applicable to the underlying zoning district in which they are permitted to establish and operate as set forth in Title 17 of the City of King Municipal Code.

(c) Any commercial cannabis business which has been determined by the City Manager or his/her designee to be an existing commercial cannabis business on the effective date of this Chapter shall be exempt from compliance with the limitations proscribed in this section, unless such location is otherwise determined to constitute a public nuisance or otherwise a disturbance to the adjacent or neighboring uses as determined by the provisions of this Chapter.

(d) No commercial cannabis cultivation business may operate within six-hundred (600) feet of any school (whether public, private, charter or other)

17.03.100 **Restriction on Alcohol Sales.**

No person shall cause or permit the sale, dispensing, or consumption of alcoholic beverages on or about the premises of any commercial cannabis business. No commercial cannabis business may operate at the same location as an alcohol-related use as that term is defined in the City of King Municipal Code.

17.03.110 **Concurrent Regulation with State.**

It is the stated intent of this Chapter to regulate commercial cannabis activity in the City of King concurrently with the state of California.

17.03.120 **Compliance with Laws.**

It is the responsibility of the owners and operators of the commercial cannabis business to ensure that it is, at all times, operating in a manner compliant with all applicable state and local laws and any regulations promulgated thereunder. Nothing in this Chapter shall be construed as authorizing any actions which violate state law or local law with respect to the operation of a commercial cannabis business. It shall be the responsibility of the owners and the operators of the commercial cannabis business to ensure that the commercial cannabis business is, at all times, operating in a manner compliant with all applicable state and local laws, any subsequently enacted state law or regulatory, licensing, or certification requirements, and any specific, additional operating procedures or requirements which may be imposed as conditions of approval of the commercial cannabis permit. Nothing in this Chapter shall be construed as authorizing any actions which violate State law with regard to the operation of a commercial cannabis business.

17.03.130 **Inspection and Enforcement.**

(a) The City Manager or his/her designee and any other City of King official charged with enforcing the provisions of the City of King Municipal Code, or any provision thereof, may enter the location of a commercial cannabis business at any time during the hours of operation without notice and inspect the location of any commercial cannabis business as well as the recordings and records maintained pursuant to this Chapter or the applicable provisions of State law.

(b) It is unlawful for any person having any responsibility over the operation of a commercial cannabis business to refuse to allow, impede, obstruct, or interfere with an inspection, or the review of the copying of records and monitoring (including recordings) including, but not limited to, the concealment, destruction, and falsification of any recordings or records.

(c) The City Manager or his/her designee or any other person charged with enforcing the provisions of this Chapter may enter the location of a commercial cannabis business at any time during the hours of operation and without notice to obtain samples of the cannabis to test for law enforcement and/or public safety purposes. Any samples obtained by the City of King shall be logged, recorded, and maintained in accordance with City of King Police Department standards for evidence. At all other times, the City Manager or his/her designee may enter the location of a commercial cannabis business to obtain samples of cannabis upon reasonable notice.

17.03.140 **Fees and Charges.**

(a) No person may commence or continue any commercial cannabis activity in the City of King without timely paying in full all fees and charges associated with the operation of a commercial cannabis activity. Fees and charges associated with the operation of a commercial cannabis activity shall be established by resolution of the City Council.

(b) All commercial cannabis businesses operating pursuant to this Chapter shall pay any and all applicable sales, use, business or other taxes, and all license, registration, or other fees pursuant to federal, state, and local law.

17.03.150 **Violation and Enforcement.**

(a) Each and every violation of the provisions of this Chapter is hereby deemed unlawful and a public nuisance.

(b) Each and every violation of this Chapter shall constitute a separate violation and shall be subject to all remedies and enforcement measures authorized by the City of King Municipal Code. Additionally, as a nuisance per se, any violation of this Chapter shall be subject to injunctive relief, any permit issued pursuant to this Chapter being deemed null and void, costs of abatement, costs of investigation, attorney fees, and any other relief or

remedy available at law or in equity. The City of King may also pursue any and all remedies and actions available and applicable under state and local laws for any violations committed by the commercial cannabis activity or persons related thereto, or associated with, the commercial cannabis activity. Additionally, when the City Manager or his/her designee determines there is an imminent threat to public health, safety or welfare, the commercial cannabis permit, issued by the City of King pursuant to this Chapter, shall immediately become suspended, pending a hearing before the City of King Planning Commission.

(c) Notwithstanding an initial verification of compliance by the commercial cannabis activity with the provisions of this Chapter, any commercial cannabis business later found to be in violation of any of the requirements of this Chapter at any time is subject to the enforcement provisions provided in this section.

(d) The remedies provided herein are not to be construed as exclusive remedies and in the event of a violation the City may pursue any proceedings or remedies otherwise provided by law.

17.03.160 **Limitations on City's Liability.**

To the fullest extent permitted by law, the City of King shall not assume any liability whatsoever with respect to having issued a commercial cannabis permit pursuant to this Chapter or otherwise approving the operation of any commercial cannabis business pursuant to this Chapter. As a condition of approval of any commercial cannabis permit issued pursuant to this Chapter, the person to which a commercial cannabis permit is issued shall be required to meet all of the following conditions:

(a) Execute an agreement indemnifying, defending (at its sole cost and expense), and holding the City of King and its officers, employees, representatives, and agents harmless from any and all claims, losses, damages, injuries or liabilities associated with the permitting or approving the operation of a commercial cannabis activity or the operation thereof or associated with the commercial cannabis business or its members' violation of any federal, state or local laws.

(b) Maintain insurance at coverages, limits, and with conditions thereon determined necessary by the City Attorney.

(c) Reimburse the City of King for any and all costs and expenses, including attorney fees and costs and court costs that the City of King may be required to pay as a result of any legal challenge related to the City's approval of a commercial cannabis permit pursuant to this Chapter or the City of King's approval of the operation of a commercial cannabis activity. The City of King may, at its sole discretion, participate at its own expense in the

defense of any such action, but such participation shall not relieve the obligations imposed under this section.

17.03.170 Application Procedures and Application Requirements

Permittee Selection Process; Criteria for Review; Renewal, Suspension or Revocation of a Permit; Appeals. In addition to those requirements set forth in this section and elsewhere in this Chapter, the City Council shall by resolution or ordinance adopt such forms, fees, and procedures as are necessary to implement this Chapter with respect to the initial selection, future selection, investigation process, renewal, revocation, and suspension of commercial cannabis business permits and appeals for the revocation or suspension of a commercial cannabis permit.

(a) At a minimum, the application shall contain the following requirements:

(1) The printed full name, signature, date of birth, social security number, and present address and telephone number of all persons and entities responsible for the operation of the commercial cannabis business including managers, corporate officers, investors, any individual with an ownership interest, any member of a board of directors, any general or limited partner, and/or any member of a decision-making body for the commercial cannabis business.

(2) The address to which correspondence from the City of King is to be sent.

(3) The names and addresses of all businesses operated by and the employment of the applicant(s) for the five (5) years immediately preceding the date of the application.

(4) Any litigation in which the applicant(s) has been involved within the five (5) years immediately preceding the date of the application and a statement of whether any business currently operated by the applicant(s) or operated by the applicant(s) within the five (5) years immediately preceding the date of the application has been investigated or the permit or license authorizing the operation of such business has been revoked or suspended within the five (5) years immediately preceding the date of the application.

(5) The address of any commercial cannabis business currently being operated by the applicant(s), or any of them, or which have been previously operated by them.

(6) The supply sources for all cannabis and cannabis products sold at the commercial cannabis business. Product supply chain including the site(s) where cultivation occurs, the product is processed or manufactured, any required testing of cannabis or cannabis products, transportation, and packaging and labelling criteria.

(7) The names and telephone numbers of the person(s) to be regularly engaged in the operation of the proposed commercial cannabis business, whether an employee, volunteer or contractor. The application shall also have the names and telephone numbers of those persons having management and supervisory responsibilities for the proposed commercial cannabis business.

(8) Odor control devices and techniques to prevent odors from marijuana from being detectable off-site.

(9) Procedures for identifying, managing, and disposing of contaminated, adulterated, deteriorated or excess medical cannabis product.

(10) Procedures for inventory control to prevent diversion of cannabis and cannabis product, employee screening, storage of cannabis and cannabis product, personnel policies, and record-keeping procedures.

(11) A detail of the procedures to be utilized at the facility including a description of how chemicals and fertilizers will be stored, handled, used and disposed of; manufacturing methods, the transportation process, inventory procedures, and quality control procedures.

(12) A site plan and floor plan of the commercial cannabis business denoting the property lines and the layout of all areas of the commercial cannabis business including storage, cultivation, manufacturing, testing, distributing, reception/waiting, and all ancillary support spaces, and the relationship of the facility to adjacent properties and land uses.

(13) Size, height, colors, and design of any proposed signage at the site. A City of King sign permit issued pursuant to the King Municipal Code shall be required.

(14) An operations and security plan.

(15) Standard operating procedures detailing how operations will comply with state and local regulations, how safety and quality of products will be ensured, record-keeping procedures for financing, testing, and adverse event recording, and product recall procedures.

(16) Proposed hours of operation.

(17) Recycling and Waste disposal information.

(18) Medical recommendation verification and youth access restriction procedures.

(19) A statement in writing by the applicant that he or she certifies under penalty of perjury that all the information contained in the application is true and correct.

(20) Detailed description of energy and water usage plan enumerating best practices and leading industry practices in efficient utilization of both resources.

(b) No person who has been convicted of a felony or crime of moral turpitude within the past ten (10) years may be engaged (actively or passively) in the operation of any commercial cannabis business. A conviction within the meaning of this sections means a plea or verdict of guilty or a conviction following a plea of nolo contendere.

(c) The City Manager or his/her designee shall review each application to determine whether it contains all of the required information. If the application does not contain all of the required information, it shall be returned to the applicant for completion. The City Manager or his/her designee shall endeavor to conclude their review within ninety (90) days of the filing of the application. If additional time is necessary, the City Manager or his/her designee will advise the applicant of an estimated review time.

(d) In reviewing an application for a permit pursuant to this Chapter or in reviewing the proposed commercial cannabis business, the City Manager or his/her designee may request whatever additional information is deemed necessary to carry out the purposes of this Chapter.

(e) The City Manager or his/her designee shall have the authority to either grant or deny the application for a commercial cannabis permit. Notwithstanding what is otherwise provided in this Chapter, the City Manager or his/her designees, when approving a commercial cannabis permit, may place any additional limitations and conditions on the operation of a commercial cannabis business as he or she deems necessary, consistent with the public interest and with this Chapter.

(f) When an application is denied, the City Manager or his/her designee shall prepare and file a statement of decision giving the reasons for the denial and the findings of fact upon which the decision is based. Any person denied a commercial cannabis permit shall have the right to appeal such denial in accordance with this section.

(g) In addition to whatever additional findings may be made by the City Manager or his/her designee, or the Planning Commission or the City Council in the event of an appeal initiated pursuant to this section, an application for a commercial cannabis permit may be denied upon making any of the following findings:

(1) The applicant made one or more false or misleading statements or omissions on the registration application or during the application process.

(2) The commercial cannabis business is not organized in strict compliance with all applicable laws and regulations.

(3) The applicant fails to meet the requirements of this Chapter or any regulation adopted pursuant to this Chapter.

(4) The operation of the proposed commercial cannabis business at the proposed location is prohibited by any state or local law or regulation.

(5) Any person who is listed on the application has been convicted of a felony within the past ten (10) years. A conviction within the meaning of this section means a plea or a guilty verdict or a conviction following a plea of nolo contendere.

(6) Any person who is listed on the application is a licensed physician making patient recommendations for medical cannabis pursuant to State law.

(7) The applicant or the operator listed in the application is less than eighteen (18) years of age.

(h) Whenever an appeal is provided for in this Chapter, such appeal shall be filed and conducted as prescribed in this subsection.

(1) Within ten (10) calendar days after the date of any denial of an application or the suspension or the revocation of a permit by the City Manager or his/her designee, an aggrieved party may appeal such action by filing with the City Clerk a written appeal setting forth the reasons why such denial, suspension or revocation is not proper.

(2) Upon receipt of such written appeal, the City Clerk shall set the matter for a hearing before the Planning Commission. The hearing shall be conducted pursuant to the procedures set forth by the City and shall be held within a reasonable time after the date of filing the appeal with the City, but in no event later than ninety (90) days from the date of such filing. At least ten (10) days prior to the date of the hearing on the appeal, the City of King shall notify the appellant of the time and the place of the hearing. At such hearing, the City Manager or his/her designeeand the appellant may present any information they deem relevant to the decision appealed. The formal rules of evidence and procedure applicable in a court of law shall not apply to such hearing.

(3) At the conclusion of the hearing, the Planning Commission may affirm, reverse or modify the decision appealed.

(4) The decision of the Planning Commission may be appealed to the City Council in accordance with this section. At the conclusion of the hearing, the City Council may affirm, reverse or modify the decision appealed. The decision of the City Council shall be the City's final decision in this regard and shall be dispositive of the matter.

17.03.180 **Records and Reporting.**

(a) Subject to the Health Insurance Portability and Accountability Act (HIPPA) regulations, each commercial cannabis business shall allow City of King officials to have access to the commercial cannabis business's books, records, accounts, and any and all data relevant to its permitted activities for the purpose of conducting an audit or examination. Books, records, accounts, and any and all relevant data will be produced no later than twenty-four (24) hours after receipt of the City's request.

(b) Each commercial cannabis business shall file with the City Manager or his/her designee an audit of its financial operations for the previous fiscal year, complete and certified by an independent certified public accountant in accordance with generally accepted auditing and accounting principles. The audit shall include but not be limited to a discussion, analysis, and verification of each of the records required to be maintained pursuant to this Chapter. The information contained in the audit shall be made available in standard electronic format which shall be compatible with Microsoft Office programs and software and which can easily be imported into either Excel, Access or any other contemporary software designed by the City Manager.

(c) All commercial cannabis businesses shall maintain an inventory control and reporting system that accurately documents the present location, amounts, and descriptions of all cannabis and cannabis products for all stages of the growing and production or manufacturing, laboratory testing and distribution processes until sold or distributed.

(d) Each owner and/or operator of a commercial cannabis business shall maintain a current register of the names and the contact information (including the name, address, and telephone number) of all employees currently employed by the commercial cannabis business and shall disclose such register to any City of King official upon request.

All records required by this Chapter shall be maintained by the commercial cannabis business for a period of not less than three (3) years and shall otherwise keep accurate records of all commercial cannabis business activity and provide such records for inspection consistent with California Business and Professions Code section 19327 and any additional rules promulgated by the licensing authority pursuant to that section or the City Council by resolution or ordinance.

17.03.190 **Prohibition on Transfer of Commercial Cannabis Permits.**

(a) No person shall operate a commercial cannabis business under a commercial cannabis permit issued pursuant to this Chapter at any place or location other than that identified on the permit.

(b) No person shall transfer ownership or control of a commercial cannabis business or transfer a permit issued pursuant to this Chapter unless and until that person first obtains the consent of the City Manager or his/her designee and the proposed transferee submits all required application materials and pays all applicable fees and charges and independently meets the requirements of this Chapter such as to be entitled to the issuance of an original commercial cannabis permit pursuant to this Chapter.

(c) Any attempt to transfer or any transfer of a commercial cannabis permit issued pursuant to this Chapter is hereby declared void and the commercial cannabis permit deemed immediately revoked and no longer of any force or effect.

17.03.200 **Packaging and Labelling.**

Prior to the sale or the delivery of any edible cannabis or edible cannabis product the same shall be labelled and in tamper-evident packaging which at least meets the requirements of California Business and Professions Code section 19347, as the same may be amended from time-to-time or superseded or replaced by subsequent State legislation or by any department or division of the State of California. The City Council may impose additional packaging and labelling requirements on cannabis or cannabis products by resolution.

17.03.210 **Operating Requirements.**

In addition to those operating requirements specifically set forth elsewhere in this Chapter and except as may otherwise be expressly set forth in this Chapter, the following operating requirements shall apply to all commercial cannabis businesses operating in the City of King.

(a) Hours of Operation. Commercial cannabis businesses may be open for access to the public only between the hours of 8:00 A.M. and 7:00 P.M. Monday through Sunday.

(b) Restriction on Consumption. Cannabis shall not be consumed on the premises of any commercial cannabis businesses or elsewhere in the City of King other than within private residences.

(c) No cannabis or cannabis products or graphics depicting cannabis or cannabis products shall be visible from the exterior of the property. No outdoor storage of cannabis or cannabis products is permitted at any time.

(d) Reporting and Tracking of Product and of Gross Sales. Each commercial cannabis business shall have in place a point-of-sale tracking system to track and to report on all aspects of the commercial cannabis business including, but not limited to, such matters as

cannabis tracking, inventory data, and gross sales (by weight and by sale) and shall ensure that such information is compatible with the City's record-keeping systems. The system must have the capability to produce historical transactional data for review by the City of King. All information provided to the City pursuant to this subsection shall be confidential and shall not be disclosed, except as may otherwise be required under law.

(e) All cannabis and cannabis products sold, distributed or manufactured shall be cultivated, manufactured, and transported by licensed facilities that maintain operations in full conformance with the State and local regulations.

(f) Emergency Contact. Each commercial cannabis business shall provide the City Manager or his/her designee with the name, telephone number (mobile preferred, if available) of an on-site employee or owner to whom emergency notice can be provided.

(g) Signage and Notices.

(1) In addition to the requirements otherwise set forth in this section, business identification signage for a commercial cannabis business shall conform to the requirements of the City of King Municipal Code, including, but not limited to, a issuance of a City of King sign permit.

(2) Business identification signage shall be limited to that needed for identification only and shall not contain any logos or information that identifies, advertises, or lists the services or the products offered. No commercial cannabis business shall advertise by having a person holding a sign and advertising the business to passersby, whether such person is on the premises of the commercial cannabis business or elsewhere including, but not limited to, the public right-of-way.

(3) No signs placed on the premises of a commercial cannabis business shall obstruct any entrance or exit to the building or any window.

(4) Each entrance to a commercial cannabis business shall be visibly posted with a clear and legible notice indicating that smoking, ingesting, or otherwise consuming cannabis on the premises or in the areas adjacent to the commercial cannabis business is prohibited.

(5) Signage shall not be directly illuminated, internally or externally. No banners, flags or other prohibited signs may be used at any time.

(h) Minors. Persons under the age of eighteen (18) years shall not be allowed on the premises of a commercial cannabis business.

It shall be unlawful and a violation of this Chapter for any person to employ any other person at a commercial cannabis business who is not at least eighteen (18) years of age.

The entrance to the commercial cannabis business shall be clearly and legibly posted with a notice that no person under the age of eighteen (18) years of age is permitted to enter upon the premises of the commercial cannabis business.

(i) Odor Control. Odor control devices and techniques shall be incorporated in all commercial cannabis businesses to ensure that odors from marijuana are not detectable off-site. Commercial cannabis businesses shall provide a sufficient odor absorbing ventilation and exhaust system so that odor generated inside the medical marijuana facility that is distinctive to its operation is not detected outside of the facility, anywhere on adjacent property or public rights-of-way, on or about the exterior or interior common area walkways, hallways, breezeways, foyers, lobby areas, or any other areas available for use by common tenants or the visiting public, or within any other unit located inside the same building as the commercial cannabis business. As such, commercial cannabis businesses must install and maintain the following equipment or any other equipment which the City Manager or his designee determines has the same or better effectiveness:

(1) an exhaust air filtration system with odor control that prevents internal odors from being emitted externally;

(2) An air system that creates negative air pressure between the commercial cannabis business's interior and exterior so that the odors generated inside the commercial cannabis business are not detectable on the outside of the commercial cannabis business.

(j) Display of Permit and City Business License. The original copy of the permit issued by the City of King pursuant to this Chapter and the business license issued by the City of King pursuant to the King Municipal Code shall be posted inside the commercial cannabis business in a location readily-visible to the public.

(k) Background Check. Every person listed as an owner, manager, supervisor or employee of the commercial cannabis business must submit fingerprints and other information deemed necessary by the Chief of Police or his designee for a background check by the City of King Police Department. No person shall be issued a permit to operate a commercial cannabis business unless they have first cleared the background check, as determined by the Chief of Police, as required by this section. A fee for the cost of the background investigation, which shall be the actual cost to the City of King to conduct the background investigation as it deems necessary and appropriate, shall be paid at the time the application for a commercial cannabis permit is submitted. The applicant(s) shall provide an initial deposit in an amount the Chief of Police or his designee estimates will cover the cost of the background investigation, which shall be used and drawn upon as a

retainer to cover the actual costs of such investigation. If this amount is not sufficient, the applicant shall provide additional amounts that are necessary and if the applicant is unable to provide the additional amounts necessary to complete the investigation, the investigation shall cease and shall not continue until such additional amounts are paid. Upon completion of the investigation or in the event the applicant withdraws their application, any unused amount will be refunded to the applicant within thirty (30) days.

(l) Loitering. The owner and/or operator of a commercial cannabis business shall prohibit loitering by persons outside the facility both on the premises and within fifty (50) feet of the premises.

(m) Permits and other Approvals. Prior to the establishment of any commercial cannabis business or the operation of any such business, the person intending to establish a commercial cannabis business must first obtain all applicable planning, zoning, building, and other applicable permits from the relevant governmental agency which may be applicable to the zoning district in which such commercial cannabis business intends to establish and to operate.

17.03.220 **Cultivation, manufacture, waste, and storage requirements.**

(a). Any person issued a permit pursuant to this chapter must follow all pesticide use requirements of local, state and federal law. The Monterey County Agricultural Commissioner may inspect the commercial cannabis business at any time during business hours to ensure compliance with this Section.

(b). All weighing devices must be maintained in compliance with local, state or federal law and comply with applicable regulations regarding device registration with the Agricultural Commissioner.

(c). Any person issued a permit pursuant to this chapter must follow all local, state and federal requirements for solid waste and hazardous waste disposal. The Monterey County Environmental Health Bureau may inspect the commercial cannabis business at any time during business hours to ensure compliance with this Section.

(d). In no case shall any hazardous, flammable or explosive substances be used to process or manufacture cannabis products on site. Food grade alcohol solely for the purposes of cleaning machinery and dissolving wax, unless otherwise prohibited by the State of California, is permitted. The City of King and Monterey County Environmental Health Bureau may inspect the commercial cannabis business at any time during business hours to ensure compliance with this Section.

(e). All food products, food storage facilities, food-related utensils, equipment and materials shall be approved, used, managed and handled in accordance to the provisions of the California Retail Food Code, California Health and Safety Code sections 113700 – 114437.

All food products shall be protected from contamination at all times, and all food handlers must be clean, in good health and free from communicable diseases. The Monterey County Environmental Health Bureau may inspect the commercial cannabis at any time during business hours to ensure compliance with this Section.

(f). Stacking shall be allowed in a given structure but only to the point that measuring the total canopy of each level of stacking is cumulatively no greater than the maximum canopy size allowed under state licensing. For purposes of this section, Stacking is defined as the practice of growing marijuana plants on platforms or tables and stacking them in multiple layers on top of each other.

17.03.230 **Limitation on the Number of Cultivation and Nursery Facilities.**

No more than one million, three hundred fifty thousand (1,350,000) square feet of total canopy whether under cultivation or nursery activity will be allowed within the City of King at any one time and commercial cannabis permits shall be issued by the City of King for cultivation and nursery activity up to a maximum one million three hundred fifty thousand (1,350,000) square feet of total canopy within the City of King. Nurseries shall be limited to a total of 25,000 square feet in size per Type 4 "Nursery" license issued by the City.

17.03.240 **Periodic Review by the City Council.**

In the sole discretion of the City Manager; the City Attorney, the Chief of Police, and the Community Development Director shall report to the City Council findings on the operation of any cultivation facilities permitted pursuant to this article and shall make a recommendation whether the cultivation facilities should be permitted to continue in operation for the remaining period of the term of their license (in addition to whatever other recommendations may be made) and whether the City should renew one or more of the permits for an additional period. Any termination or revocation of a license or permit, shall be in accordance with the City of King Municipal Code.

17.03.250 **Operating Requirements for Cultivation and Nurseries.**

(a) Outdoor Cultivation and Nursery activity Prohibited. All outdoor cultivation and nursery activity is prohibited.

(b) In no case shall cannabis plants be visible from a public or private road, sidewalk, park or any common public viewing area.

(c) If a parcel or lot includes nursery activities as defined in Business and Professions Code §19332, the parcel or lot may have only one nursery located on the parcel or lot and the nursery activity must be permitted pursuant to this Chapter and state law. The nursery shall be limited to a maximum size of twenty-five thousand square feet of canopy for each parcel or lot,

(d) Cannabis cultivation and nursery activity shall be conducted in accordance with state and local laws related to land conversion, grading, electricity, water usage, water quality, woodland and riparian habitat protection, agricultural discharges, and similar matters.

(e) Pesticides and fertilizers shall be properly labeled and stored to avoid contamination through erosion, leakage or inadvertent damage from pests, rodents or other wildlife.

(f) In no case shall any hazardous, flammable or explosive substances be used to process or manufacture cannabis products on site. Food grade alcohol solely for the purposes of cleaning machinery and dissolving wax, unless otherwise prohibited by the State of California, is permitted.

(g) The cultivation of cannabis and any nursery activity shall at all times be operated in such a way as to ensure the health, safety, and welfare of the public, the employees working at the commercial cannabis business, visitors to the area, neighboring properties, and the end users of the cannabis being cultivated, to protect the environment from harm to streams, fish, and wildlife; to ensure the security of the cannabis being cultivated; and to safeguard against the diversion of cannabis for non-medical purposes.

(h) All applicants for a cannabis cultivation or nursery permit shall submit the following in addition to the information generally otherwise required for a commercial cannabis business:

(1) An operations plan that meets or exceeds minimum legal standards for water usage, conservation and use; drainage, runoff, and erosion control; watershed and habitat protection; and proper storage of fertilizers, pesticides, and other regulated products to be used on the parcel, and a description of the nursery or cultivation activities and schedule of activities during each month of growing and harvesting, or explanation of growth cycles and anticipated harvesting schedules for all-season harvesting.

(2) A description of a legal water source, irrigation plan, and projected water use.

(3) Identification of the source of electrical power and plan for compliance with applicable Building Codes and related codes.

(4) Plan for addressing odor and other public nuisances which may derive from the nursery or cultivation site.

17.03.260 **Cannabis Manufacturing; Edibles and Other Cannabis Products; Sale or Distribution of Edible and Other Cannabis Products.**

The manufacturing of food or other products infused with or which otherwise contain cannabis may be manufactured within the appropriate zoning districts as defined in Title 17,

Zoning, of the City of King Municipal Code, subject to the regulations set forth in this section and subject to whatever additional regulations may be promulgated hereunder by an ordinance or resolution of the City Council or otherwise pursuant to this Chapter.

(a) No edible cannabis products shall be sold or distributed on a retail basis at a commercial cannabis business operating under a permit issued pursuant to this Chapter. Edible Cannabis products may be sold wholesale for retail sale outside of the City boundaries.

(b) All items to be sold or distributed wholesale shall be individually wrapped at the original point of preparation. Labeling must include a warning if nuts or other known allergens are used, and must include the total weight (in ounces or grams) of cannabis in the package. A warning that the item is a medication and not a food must be clearly legible on the front of the package. The package must have a label warning that the product is to be kept away from children. The label must also state that the product contains cannabis and must specify the date of manufacture.

(c) Any edible cannabis product that is made to resemble a typical food product must be in a properly labeled opaque (non-see-through) package before it leaves the commercial cannabis business. Deliveries must be in a properly labeled opaque package when delivered.

17.03.270 **Cannabis Manufacturing: Extraction, etc.**

(a) Cannabis manufacturing facilities requiring a Type-6 state license (non-volatile manufacturing) as defined in Business and Professions Code §19341, may be permitted to operate within the appropriate industrial districts as defined in Title 17 of the City of King Municipal Code. Cannabis manufacturing facilities requiring a Type-7 state license, Manufacturing Level 2, as defined in Business and Professions Code §19341 is prohibited in all zone districts in the City of King. No volatile fluid or material, ~~including alcohol or ethanol,~~ shall be used in Type-6 licensed manufacturing facilities unless otherwise authorized and approved by the State of California in accordance with MMRSA. For purposes of this Section, food grade alcohol utilized solely to clean machinery and dissolve wax, unless otherwise prohibited by the State of California, is permitted. No more than fifty (50) gallons of food grade alcohol may be stored on any property subject to a Cannabis permit.

(b) Any compressed gases used in the manufacturing process shall not be stored on any property within the City of King in containers that exceed 150 pound tanks in size. Each site or parcel subject to a Cannabis permit shall be limited to a total of eight tanks on the property at any time.

(c) No more than six commercial cannabis manufacturing businesses may operate within the City of King at any one time and no more than six commercial cannabis manufacturing permits shall be issued by the City of King for commercial cannabis manufacturing businesses to operate within the City of King.

17.03.280 **Promulgation of Regulations and Standards.**

(a) The City Manager or his/her designee is authorized to promulgate all regulations necessary to implement the requirements and fulfill the policies of this Chapter related to cannabis and cannabis products.

(b) Regulations shall be published on the City's website.

(c) Regulations promulgated by the City Manager or his/her designee shall have the same force and effect of law and become effective upon date of publication.

17.03.290 **Community Relations.**

(a) Each commercial cannabis business shall provide the name, telephone number, and email address of a community relations contact to whom notice of problems associated with the commercial cannabis business can be provided. Each commercial cannabis business shall also provide the above information to all businesses and residences located within one hundred (100) feet of the commercial cannabis business.

(b) During the first year of operation pursuant to this Chapter, the owner, manager, and community relations representative from each commercial cannabis business holding a permit issued pursuant to this Chapter shall attend a quarterly meeting with the City Manager or his designee to discuss costs, benefits, and other community issues arising as a result of implementation of this Chapter. After the first year of operation, the owner, manager, and community relations representative from each such commercial cannabis business shall meet with the City Manager or his/her designee when and as requested by the City Manager or his/her designee.

(c) Commercial cannabis businesses to which a permit is issued pursuant to this Chapter shall develop and make available to youth organizations and educational institutions a public education plan that outlines the risks of youth addiction to marijuana and that identifies resources available to youth related to drugs and drug addiction.

17.03.300 **Fees Deemed Debt to City of King.**

The amount of any fee, cost or charge imposed pursuant to this Chapter shall be deemed a debt to the City of King that is recoverable in any court of competent jurisdiction.

17.03.310 **Permit Holder Responsible for Violations.**

The person to whom a permit is issued pursuant to this Chapter shall be responsible for all violations of the laws of the State of California or of the regulations and the ordinances of the City of King, whether committed by the permittee or any employee or agent of the permittee, which violations occur in or about the premises of the commercial cannabis business whether or not said violations occur within the permit holder's presence.

SECTION 2. **Severability**. If any section, subsection, sentence, clause or phrase of this Ordinance is for any reason held invalid by a court of competent jurisdiction, such a decision shall not affect the validity of the remaining portions of this Ordinance. The City Council declares that it would have passed this Ordinance and each section, subsection, sentence, clause, or phrase thereof, irrespective of the fact that one or more sections, subsections, sentences, clauses, or phrases, be declared invalid.

SECTION 3. All ordinances and parts of ordinances in conflict with those sections amended or added herein are hereby repealed.

SECTION 4. Effective Date. This ordinance shall become effective and in full force and effect at 12:01 a.m. on the thirty first day after its final passage.

This Ordinance was introduced and read by title only on the ____ day of _____ 2016 and was passed and adopted on this ____ day of _____2016.

PASSED AND ADOPTED this _____ day of _____2016 by the following vote:

AYES:
NOES:
ABSENT:
ABSTAIN:

APPROVED:

_____
Mayor Robert Cullen, City of King

ATTEST:

_____
City Clerk of the Council of the City of King

Attachment 2

ORDINANCE NO. 2016-729

AN ORDINANCE OF THE CITY COUNCIL OF CITY OF KING AMENDING SUBSECTIONS (1) AND (14) OF SECTIONS 17.30.020, SUBSECTION (2) OF 17.30.140, SUBSECITON (18) OF SECTION 17.31.020, AND SUBSECTION (4) OF SECTION 17.31.140 AND REPEALING SUBSECTION (15) OF SECTION 17.30.020, SECTION 17.30.150, AND SECTION 17.31.150 AND REPLACING SUBSECTION (15) OF SECTION 17.30.020, AND ADDING SUBSECTION (16) OF SECTION 17.30.020 OF THE CITY OF KING MUNICIPAL CODE ADDING ADDITIONAL COMMERCIAL CANNABIS CULTIVATION LICENSING, NURSERIES, MANUFACTURING, AND TESTING LABORATORIES IN THE CITY

WHEREAS, in 1996, the voters of the State of California approved Proposition 215, which was codified as "The Compassionate Use Act of 1996," at California Health and Safety Code, section 11362.5 ("CUA") which had the stated intent to ensure that seriously ill individuals have the right to obtain and use marijuana for medical purposes when recommended by a physician. The Proposition further provides that "nothing in this section shall be construed to supersede legislation prohibiting persons from engaging in conduct that endangers others, or to condone the diversion of marijuana for non-medical purposes, and

WHEREAS, the ballot arguments supporting Proposition 215 expressly acknowledged that "Proposition 215 does not allow unlimited quantities of marijuana to be grown anywhere", and

WHEREAS, in 2004, the Legislature enacted Senate Bill 420 (codified as California Health & Safety Code § 11362.7 *et seq.* and referred to as the "Medical Marijuana Program" or "MMP" to clarify the scope of Proposition 215 and to provide qualifying patients and primary caregivers who collectively or cooperatively cultivate marijuana for medical purposes with a limited defense to certain specified State criminal statutes. Assembly Bill 2650 (2010) and Assembly Bill 1300 (2011) amended the MMP to expressly recognize the authority of counties and cities to "adopt local ordinances that regulate the location, operation, or establishment of a medical, and

WHEREAS, in the *City of Riverside v. Inland Empire Patients Health and Wellness Center, Inc.,* 56 Cal.4th 729 (2013), the California Supreme Court upheld the right of local public agencies to regulate medical marijuana operations through their land use powers, and

WHEREAS, on November 26, 2013, the Third District Court of Appeal issued its opinion in *Maral v. City of Live Oak* 221 Cal.App.4th 975, which held cities have the authority to ban marijuana cultivation within their boundaries consistent with their local regulations; and

WHEREAS, on October 9, 2015, California Governor Brown approved the Medical Marijuana Regulation and Safety Act ("MMRSA"), which goes into effect on January 1, 2016, and

establishes a comprehensive State licensing and regulatory framework for the cultivation, manufacture, transportation, storage, distribution, and sale of medical marijuana, also known as cannabis, through Assembly Bills 243 and 266 and Senate Bill 643, and

WHEREAS, MMRSA will become the governing regulation giving the State full control over the cultivation of marijuana in any city where local regulations were not adopted to regulate cultivation of medical cannabis and in effect on March 1st 2016; and

WHEREAS, the City intends to regulate and maintain local control over the dispensing, delivery and cultivation of medical cannabis in accordance with this ordinance; and

WHEREAS, mindful of the fact that marijuana possession and use is prohibited under federal law and partially decriminalized under state law, it is the Council's intention that nothing in this ordinance shall be construed, in any way, to expand the rights of anyone to use or possess marijuana under state law; engage in any public nuisance; violate federal law, or engage in any activity in relation to the cultivation, distribution, or consumption of marijuana that is otherwise illegal. It is further the intent of the City Council of City of King to maintain local control over these matters to the fullest extent permitted by law.

NOW THEREFORE BE IT ORDAINED BY THE CITY COUNCIL OF CITY OF KING AS FOLLOWS:

Section 1: Subsection (1) of Section 17.30.020 of Chapter 17.30 of the City of King Municipal Code is hereby amended as follows:

(1) Manufacture, processing and packing of beverages (except distilleries), food or food products [(except Commercial Medical Cannabis Activity as defined within subsection (14) this section)] completely within a structure or processing and packing of food products when the major operation takes place in unenclosed structures and where products, materials and equipment are stored in the open;

Section 2: Subsection (14) of Section 17.30.020 of Chapter 17.30 of the City of King Municipal Code is hereby amended as follows:

(14) Commercial Medical Cannabis Cultivation [and nurseries] consistent with those activities authorized under the state cultivator [and nursery] license types issued by the Department of Food and Agriculture under Business and Professions Code Section 19332(g)(5) Type 2A "small indoor"[, 19332 (g)(6) Type 2B "small mixed-light"], ~~and~~ [19332 (g)](8) Type 3A "indoor~~.~~" [19332 (g)(9) Type 3B "mixed-light" and 19332 (g)(10) Type 4 "nursery".] Cultivation for purposes of this provision shall be limited to those activities defined within California Business and Professions Code Section 19300.5(l) and the delivery or transport of the harvested cannabis outside of the city. No deliveries or distribution of any cannabis product shall be allowed within the jurisdictional boundaries of the city;

Section 3: Subsection (15) of Section 17.30.020 of Chapter 17.30 of the City of King Municipal Code is hereby repealed in its entirety and replaced with the following:

(15) Commercial cannabis level one manufacturing and testing consistent with those activities authorized under the state manufacturing and testing laboratories license types issued by the State Department of Health under Business and Professions Code Sections 19300.7 and 19341 (a) Type 6 "Manufacturer 1" and 19341 (c) Type 8 "testing";

Section 4: Subsection (16) of Section 17.30.020 of Chapter 17.30 of the City of King Municipal Code is added as follows:

(16) Any other use which the planning commission finds not to be inconsistent with the uses set out herein.

Section 5: Subsection (2) of Section 17.30.140 (2) of Chapter 17.30 of the City of King Municipal Code is hereby amended as follows:

(2) Warehousing and wholesaling; and commercial cannabis cultivation [, level one manufacturing and testing];

Minimum of 2 spaces for every 3 employees on largest shift but non less than 1 per 3000 square feet of gross floor area.

Section 6: Section 17.30.150 of Chapter 17.30 of the City of King Municipal Code is hereby repealed and replaced as follows:

~~17.30.150 Commercial Cannabis Cultivation Property Development Standards~~

~~a) Indoor Medical Marijuana Cultivation may not occur in multi-use buildings. All uses in the structure must be related to the Cultivation of Medical Marijuana.~~

~~b) Caretakers quarters are not allowed.~~

~~c) Indoor Medical Marijuana Cultivation is allowed only within fully enclosed and secure structures that are inaccessible to minors.~~

~~d) Indoor Medical Marijuana Cultivation shall not exceed the square footage authorized by the Conditional Use Permit and consistent with State licensing.~~

~~e) There shall be no exterior evidence of indoor Medical Marijuana Cultivation from a public right-of-way. Signage for the business shall be consistent with state law and local sign regulations.~~

~~f) The building entrance to a Medical Marijuana Cultivation facility shall be clearly and legibly posted with a notice indicating that smoking, ingesting, or consuming marijuana on the premises or in the vicinity of the facility is prohibited.~~

~~g) Marijuana shall be kept in a secured manner during business and nonbusiness hours. A security plan shall be implemented as part of the conditions of the CUP that shall include security cameras, an alarm system, locked facilities and appropriate illumination as determined by the Police Chief to assure adequate preservation of health and safety to the public.~~

Section 7: Subsection (18) of Section 17.31.020 of Chapter 17.31 of the City of King Municipal Code is hereby amended as follows:

(18) Commercial cannabis cultivation [and nurseries] consistent with those activities authorized under the State cultivator [and nursery] license types issued by the Department of Food and Agriculture under Business and Professions Code section 19332 (g) (5) Type 2A "small indoor"[, 19332 (g)(6) Type 2B "small mixed-light"], and [193332 (g)] (8) Type 3A "indoor", [19332 (g) (9) Type 3B "mixed light" and 19332 (g) (10) Type 4 "nursery".] Cultivation for purposes of this provision shall be limited to those activities defined within California Business and Professions Code section 19300.5 (l) and the delivery or transport of the harvested cannabis outside of the City. No deliveries or distribution of any cannabis product shall be allowed within the jurisdictional boundaries of the City. All cultivation shall be conducted indoors.

Section 8: Subsection (4) of Section 17.31.140 of Chapter 17.31 of the City of King Municipal Code is hereby amended as follows:

(4) Warehousing and wholesaling; and Commercial Cannabis Cultivation [, level one manufacturing and testing;"

Minimum of 2 spaces for every 3 employees on largest shift but not less than 1 space per 3000 square feet of gross floor area. Parking may be off-site within 300 feet upon approval of the planning commission.

Section 9: Section 17.31.150 of Chapter 17.31 of the City of King Municipal Code is hereby repealed and replaced as follows:

~~17.31.150 Commercial Cannabis Cultivation Property Development Standards~~

~~a) Indoor Medical Marijuana Cultivation may not occur in multi-use buildings. All uses in the structure must be related to the Cultivation of Medical Marijuana.~~

~~b) Caretakers quarters are not allowed.~~

~~c) Indoor Medical Marijuana Cultivation is allowed only within fully enclosed and secure structures that are inaccessible to minors.~~

~~d) Indoor Medical Marijuana Cultivation shall not exceed the square footage authorized by the Conditional Use Permit and consistent with State licensing.~~

~~e) There shall be no exterior evidence of indoor Medical Marijuana Cultivation from a public right-of-way. Signage for the business shall be consistent with state law and local sign regulations.~~

~~f) The building entrance to a Medical Marijuana Cultivation facility shall be clearly and legibly posted with a notice indicating that smoking, ingesting, or consuming marijuana on the premises or in the vicinity of the facility is prohibited.~~

~~g) Marijuana shall be kept in a secured manner during business and nonbusiness hours. A security plan shall be implemented as part of the conditions of the CUP that shall include security cameras, an alarm system, locked facilities and appropriate illumination as determined by the Police Chief to assure adequate preservation of health and safety to the public.~~

a) All Commercial Cannabis activity shall be subject to and comply with all provisions of the King City Municipal Code Chapter 17.03.

Section 10: All ordinances and parts of ordinances in conflict with those sections amended or added herein are hereby repealed.

Section 11: This ordinance shall become effective and in full force and effect at 12:01 a.m. on the thirty-first day after its final passage.

PASSED ADOPTED AND APPROVED THIS _____ day of _____, 2016.

_____
Mayor Robert Cullen, City of King

ATTEST:

_____
City Clerk of the Council of the
City of King, Steven Adams

ORDINANCE NO. 2016-730

AN ORDINANCE OF THE CITY COUNCIL OF CITY OF KING AMENDING SECTION B. 1.c.ii, SUBSECTION (I), AMENDING SECTION D. 3, SUBSECTION (g), AND AMENDING G. 5 OF CHAPTER 4 (DEVELOPMENT STANDARDS) OF THE EAST RANCH BUSINESS PARK SPECIFIC PLAN FOR THE PURPOSE OF ADDING ADDITIONAL COMMERCIAL CULTIVATION USES, NURSERIES, MANUFACTURING AND TESTING OF CANNABIS IN THE CITY

WHEREAS, in 1996, the voters of the State of California approved Proposition 215, which was codified as "The Compassionate Use Act of 1996," at California Health and Safety Code, section 11362.5 ("CUA") which had the stated intent to ensure that seriously ill individuals have the right to obtain and use marijuana for medical purposes when recommended by a physician. The Proposition further provides that "nothing in this section shall be construed to supersede legislation prohibiting persons from engaging in conduct that endangers others, or to condone the diversion of marijuana for non-medical purposes, and

WHEREAS, the ballot arguments supporting Proposition 215 expressly acknowledged that "Proposition 215 does not allow unlimited quantities of marijuana to be grown anywhere", and

WHEREAS, in 2004, the Legislature enacted Senate Bill 420 (codified as California Health & Safety Code § 11362.7 *et seq.* and referred to as the "Medical Marijuana Program" or "MMP" to clarify the scope of Proposition 215 and to provide qualifying patients and primary caregivers who collectively or cooperatively cultivate marijuana for medical purposes with a limited defense to certain specified State criminal statutes. Assembly Bill 2650 (2010) and Assembly Bill 1300 (2011) amended the MMP to expressly recognize the authority of counties and cities to "adopt local ordinances that regulate the location, operation, or establishment of a medical, and

WHEREAS, in the *City of Riverside v. Inland Empire Patients Health and Wellness Center, Inc.,* 56 Cal.4th 729 (2013), the California Supreme Court upheld the right of local public agencies to regulate medical marijuana operations through their land use powers, and

WHEREAS, on November 26, 2013, the Third District Court of Appeal issued its opinion in *Maral v. City of Live Oak* 221 Cal.App.4th 975, which held cities have the authority to ban marijuana cultivation within their boundaries consistent with their local regulations; and

WHEREAS, on October 9, 2015, California Governor Brown approved the Medical Marijuana Regulation and Safety Act ("MMRSA"), which goes into effect on January 1, 2016, and establishes a comprehensive State licensing and regulatory framework for the cultivation,

manufacture, transportation, storage, distribution, and sale of medical marijuana, also known as cannabis, through Assembly Bills 243 and 266 and Senate Bill 643, and

WHEREAS, MMRSA will become the governing regulation giving the State full control over the cultivation of marijuana in any city where local regulations were not adopted to regulate cultivation of medical cannabis and in effect on March 1st 2016; and

WHEREAS, the City intends to regulate and maintain local control over the dispensing, delivery and cultivation of medical cannabis in accordance with this ordinance; and

WHEREAS, mindful of the fact that marijuana possession and use is prohibited under federal law and partially decriminalized under state law, it is the Council's intention that nothing in this ordinance shall be construed, in any way, to expand the rights of anyone to use or possess marijuana under state law; engage in any public nuisance; violate federal law, or engage in any activity in relation to the cultivation, manufacturing, testing, or consumption of marijuana that is otherwise illegal. It is further the intent of the City Council of City of King to maintain local control over these matters to the fullest extent permitted by law.

NOW THEREFORE BE IT ORDAINED BY THE CITY COUNCIL OF CITY OF KING AS FOLLOWS:

Section 1: Section B.1.C.ii, subsection (I) of Chapter 4, "Development Standards" of the East Ranch Business Park Specific Plan is hereby amended as follows:

(I). for Commercial Cannabis [Activity]~~Cultivation~~:

a) An indoor and outdoor lighting plan with estimated amount of electrical use.

b). The location and dimensions of areas for storage fertilizers and wastes

c). A fire suppression plan.

d). An irrigation and drainage plan with estimate amount of water use.

[e.). Compliance with all provisions of King City Municipal Code Chapter 17.03.]

Section 2: Section D.3., subsection (g) of Chapter 4, "Development Standards" of the East Ranch Business Park Specific Plan is hereby amended as follows:

(g). Commercial Cannabis [Activity]~~Cultivation~~ consistent with those activities authorized under ~~the State cultivator license types issued by the Department of Food and Agriculture under~~ Business and Professions Code section ~~19332~~ [19300.7, (e) Type 2A

Cultivation, Indoor; Small, (f) Type 2B Cultivation; Mixed-light; Small, (h) Type 3A Cultivation; Indoor; Medium, (i) Type 3B Cultivation; Mixed-light; Medium, (j) Type 4 Cultivation; Nursery, (k) Type 6 Manufacturing 1, and (m) Type 8 Testing~~(g) (5) Type 2A "small indoor" and (8) Type 3A "indoor"~~. [Commercial Cannabis Activity shall be subject to and comply with all provisions of the King City Municipal Codes Chapter 17.03.]~~Cultivation for purposes of this provision shall be limited to those activities defined within California Business and Professions Code section 19300.5 (l) and the delivery or transport of the harvested cannabis outside of the City. No deliveries or distribution of any cannabis product shall be allowed within the jurisdictional boundaries of the City.~~

Section 3: Section G.5. of Chapter 4, "Development Standards" of the East Ranch Business Park Specific Plan is hereby repealed and replaced as follows:

5. Commercial Cannabis Activity

a) All Commercial Cannabis Activity shall be subject to and comply with all provisions of the King City Municipal Code Chapter 17.03.

Section 4: All ordinances and parts of ordinances in conflict with those sections amended or added herein are hereby repealed.

Section 5: This ordinance shall become effective and in full force and effect at 12:01 a.m. on the thirty-first day after its final passage.

PASSED ADOPTED AND APPROVED THIS _____ day of _____, 2016.

_____
Mayor Robert Cullen, City of King

ATTEST:

_____
City Clerk of the Council of the
City of King

CITY OF KING
ZONING CODE AMENDMENTS
INITIAL STUDY/MITIGATED NEGATIVE DECLARATION

Prepared for:

CITY OF KING
Community Development Department
212 S. Vanderhurst Avenue
King City, CA 93930

Prepared by:

DOUGLAS WOOD & ASSOCIATES, INC.
1461 Higuera Street
San Luis Obispo, California 93401

August 15, 2016

TABLE OF CONTENTS

Section		Page
I.	INTRODUCTION AND PURPOSE	1
II.	SUMMARY/MITIGATION MONITORING PROGRAM	4
III.	PROJECT DESCRIPTION	17
IV.	EXISTING CONDITIONS	21
V.	ENVIRONMENTAL EVALUATION	22
VI.	MANDATORY FINDINGS OF SIGNIFICANCE	39
VII.	ENVIRONMENTAL DETERMINATION	41
VIII.	CERTIFICATION	42

I. INTRODUCTION AND PURPOSE

This Initial Study/Mitigated Negative Declaration assesses the potential environmental impacts and identifies appropriate mitigation measures associated with the proposed commercial cultivation, manufacturing and testing of medical cannabis (to be referred to herein as the "proposed project"). The City of King (to be referred to herein as "the City") as Lead Agency for this environmental document, has the responsibility for determining whether or not to approve the proposed project.

As part of their decision-making process, the City is required to review and consider the potential environmental effects that could result from the proposed project. Together with the technical analyses applicable to this project and any other documents incorporated by reference, this analysis will serve as the initial environmental review for the proposed project. This review is required by the California Environmental Quality Act of 1970 (CEQA) as amended (Public Resources Code Section 21000 et. seq.) and the State CEQA Guidelines as well as Guidelines for the Implementation of CEQA adopted by the City.

The City is preparing this Initial Study to assist in their consideration as to whether to prepare a Negative Declaration, a Mitigated Negative Declaration or an Environmental Impact Report (EIR) for this proposed project.

Section 15070 of the State CEQA Guidelines states that "a public agency shall prepare or have prepared a proposed negative declaration or mitigated negative declaration for a project subject to CEQA when the Initial Study shows that there is no substantial evidence, in light of the whole record before the agency, that the project may have a significant effect on the environment." Section 15064 (a) (1) states "if there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, the agency shall prepare a Draft EIR." The determination as to which document is appropriate in this situation will be based upon the information and analyses contained in this Initial Study in combination with any other documents incorporated by reference.

This Initial Study/Mitigated Negative Declaration has been prepared in a manner which provides complete and adequate California Environmental Quality Act (CEQA) coverage for all actions and approvals associated with the proposed project as currently described herein (See Section III. Project Description). However, this Initial Study/Mitigated Negative Declaration may not be the final environmental document for the proposed project. In the event that future development applications for the commercial cultivation of medical cannabis contain specific design or operational elements not addressed by this Initial Study, additional, more detailed environmental documentation may be necessary at that time. When applications for individual projects are submitted, they will be subject to additional environmental review by the City in order to 1) determine the nature and extent of any potentially significant impacts not addressed in this document and 2) ensure that the individual project does not exceed the maximum development levels and cumulative impacts identified in

this analysis. These individual projects will be approved by the City through the approval and issuance of Conditional Use Permits ("CUP's").

This approach, known as "tiering", is addressed in Sections 15152 and 15385 of the State CEQA Guidelines. These sections state that tiering refers to the use of an analysis of general issues contained in a broad environmental document within a later, more detailed environmental document. These guidelines further state that tiering is appropriate when the sequence of analyses for a proposed project is from an environmental document prepared for a general plan, policy or program to a document for another, more detailed plan, policy or program of lesser scope or to a site specific project. In this case, the previously approved (January, 2016) modifications to various zoning designations represents the "broader" program and environmental document while the current project proposal reflected in this document is considered a more detailed analysis of potential impacts associated with the proposed commercial cultivation, manufacturing and testing of medical cannabis. This analysis also provides an indication of the maximum probable "worst case" impacts of full development of medical cannabis cultivation facilities throughout the City. Subsequent environmental documents may also be required for future development applications in order to address environmental issues with specific design or operational elements associated with these more detailed proposals.

This Initial Study/Mitigated Negative Declaration begins with Section I. Introduction and Purpose, which provides an introductory discussion of the purpose and scope of the document. Section II. Summary/Mitigation Monitoring Program summarizes the potential impacts and proposed mitigation measures. This section also contains the State-mandated Mitigation Monitoring Program (pursuant to AB3180). Section III. Project Description provides a detailed description of the proposed commercial cultivation of medical cannabis. Section IV. Environmental Setting provides an overview description of existing environmental conditions within and in the vicinity of the project site.

Section V. Environmental Evaluation contains the environmental checklist required by Section 15063(d)(3) of the State CEQA Guidelines. This checklist is intended to determine the nature and extent of various environmental effects of the proposed project followed by an explanation to justify the determination. In many instances, project impacts are identified as "not significant" The summary discussion following the checklist item provides the basis for this determination. Checklist items identified as "potentially significant and mitigated", "unknown potential significant" or "significant" are discussed within Section V. Environmental Evaluation. Section VI. provides the required Mandatory Findings of Significance pursuant to CEQA Section 15065. Section VII. Environmental Determination makes the final determination as to whether an EIR, Negative Declaration or Mitigated Negative Declaration is appropriate. Section VIII. Certification provides the required Lead Agency Certification Statement.

Section 15150 of the State CEQA Guidelines permits an environmental document to incorporate by reference other documents that provide relevant data to the proposal currently being considered. The City General Plan, and Zoning Code as well as any other long-range planning documents prepared by the City as well as engineering and other technical studies as noted within this Initial Study are hereby incorporated by reference.

Section 15151 of the State CEQA Guidelines states that :

> "An EIR [or any other environmental document] should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR [or any other environmental document] is to be reviewed in the light of what is reasonably feasible. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure."

This Initial Study/Mitigated Negative Declaration provides a full and objective discussion of the potential environmental impacts of the proposed commercial cultivation of medical cannabis In preparing this document, the City decision-makers, staff and members of the public will be fully informed as to the potential impacts and required mitigation measures associated with the proposed project. In accordance with Section 15021 of the State CEQA Guidelines, this document is intended to enable the City, as Lead Agency, to fully evaluate these environmental impacts and mitigation measures in their consideration of the proposed project. The Lead Agency has an obligation to balance potential adverse effects of the project against a variety of public objectives, including economic, environmental and social factors, in determining whether the project is acceptable and approved for construction and operation.

Pursuant to California Public Resources Code 21082.1, the City has independently reviewed and analyzed the information contained in this Initial Study/Mitigated Negative Declaration prior to its consideration and certification. The conclusions and discussions contained herein reflect the independent judgment of the City of King relative to that information at the time of publication.

II. SUMMARY/MITIGATION MONITORING PROGRAM

1. Aesthetics

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will involve the construction of greenhouse structures which will range in size from approximately 13.000 to 30,000 square feet. The greenhouse buildings will have glass roofs and sidewalls consisting of solid materials (i.e., brick, metal, wood, etc.).

In addition, other structures necessary to house manufacturing facilities, security offices, storage facilities and administrative offices will also be constructed.

All structures and other project facilities will be subject to the City's design standards applicable to the M-1 and M-2 zoning or the East Ranch Business Park. These proposed facilities will also be visually compatible with the existing industrial and commercial uses in adjacent areas.

None of the proposed structures or other project facilities will have a substantial adverse effect upon any scenic vistas or scenic resources nor will they degrade the visual character or quality of the site or its surroundings.

Lighting within the greenhouses will be provided by natural sunlight and/or artificial lighting systems. All lighting shall be directed downward and oriented in a manner to mitigate potential light and glare impacts upon surrounding areas.

Mitigation Measures:

1-1 – All proposed project structures and facilities shall be subject to the City's design standards applicable to the M-1 and M-2 zoning or the East Ranch Business Park.

1-2 –As part of the Conditional Use Permit application process, the project applicant shall submit to the City for review and approval a Lighting Plan which describes all proposed interior and exterior lighting and provides feasible methods by which all light is directed downward which prevents substantial light and glare impacts to adjacent areas.

Implementation Responsibility: Applicant/Owner/Developer of future individual projects

Monitoring Agency: City of King

Timing: Prior to the issuance of Conditional Use Permit

2. Agricultural Resources

Impacts: Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities are either developed or highly disturbed and do not contain existing agricultural operations nor any areas designated as prime farmland, unique farmland, or farmland of statewide importance. These proposed future uses will, therefore, not conflict with any areas zoned for agricultural use or covered by a Williamson Act contract nor will they result in any conversion of existing farmland to non-agricultural use.

Mitigation Measures: Given the lack of potentially significant impacts to agricultural resources, no mitigation measures are required.

3. Air Quality

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will generate additional motor vehicle trips associated with employee travel to and from the facilities as well as occasional truck trips associated with facility operations. This generation of additional motor vehicle trips is not expected to conflict with any applicable air quality plans or regulations or violate any established air quality standards or substantially contribute to a projected air quality violation. These proposed future uses will not result in any cumulative net increase of any pollutant for which the region is in non-attainment.

The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will not generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment nor will they conflict with any applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Medical cannabis cultivation, manufacturing and testing facilities have the potential to generate odors that can become a source of complaints from local residents adjacent to the facility. The high degree of humidity and moisture required for the cultivation and production of medical cannabis can result in the generation of mold.

Mitigation Measures:

3-1 – All proposed project structures and facilities shall be subject to permit conditions that monitor and prevent the production of odors outside of the building as well as the monitoring and prevention of mold within and near the buildings by the inclusion of air filters, recirculation of internal air or other appropriate means of filtering odors that may otherwise escape from the subject facilities.
Implementation Responsibility: Applicant/Owner/Developer of future individual projects
Monitoring Agency: City of King

Timing: Prior to the issuance of Conditional Use Permit

4. Biological Resources

Impacts: Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities are either developed or highly disturbed and do not include areas containing any rare or endangered plant or animal species. These proposed future uses will, therefore, not result in any modification to sensitive biological habitats nor will they impact any species identified as a candidate, sensitive or special status species. No significant impacts to existing riparian habitats or other sensitive natural communities, Federally protected wetlands, or established migratory wildlife corridors are anticipated. Future project facilities will not conflict with any local policies or ordinances protecting biological resources or provisions of any approved local, regional or state habitat conservation plan.

Mitigation Measures: Given the lack of potentially significant impacts to biological resources, no mitigation measures are required.

5. Cultural Resources

Impacts: Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities are either highly developed or highly disturbed and do not contain any known archaeological sites, paleontological resources or historical structures. However, significant archaeological, paleontological or historic resources may be discovered during project grading or construction. In that event, these resources will either be excavated or protected in a manner consistent with all applicable State and local laws, and all work will be halted and the resources will be evaluated by a qualified professional.

Mitigation Measures:

5-1 - In the event of an accidental discovery or recognition of any human remains, archaeological resources, paleontological resources or historical resources on the project site, if said resources are found during excavation or construction, work will be halted at a minimum of 30 feet from the find and the area will be staked off. There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie cultural resources, paleontological resources, historical resources or, in the case of adjacent human remains until the coroner of Monterey County is contacted to determine that no investigation of the cause of death is required. If the coroner determines the remains to be Native American, the coroner shall contact the Native American Heritage Commission within 24 hours. A qualified professional (to be hired by the applicant and accepted by the City) in cultural resources, paleontological resources or historical resources shall evaluate the resources discovered at the site and provide recommendations for disposition of those resources. In the case of human remains, the Native American Heritage

Commission shall identify the person or persons it believes to be the most likely descendent ("MLD") from the deceased Native American. The MLD may then make recommendations to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and associated grave goods as provided in Public Resources Code Section 5097.98. The landowner or it's authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further disturbance if: a) the Native American Heritage Commission is unable to identify a MLD or the MLD failed to make a recommendation within 24 hours after being notified by the commission; b) the descendent identified fails to make a recommendation; or c) the landowner or it's authorized representative rejects the recommendation of the descendent, and the mediation by the Native American Heritage Commission fails to provide measures acceptable to the landowner.

5-2 – Pursuant to CEQA requirements, mitigation measures shall be required in the event that unique archaeological resources are not preserved in place or not left in an undisturbed state. The project applicant shall provide a guarantee to the City, as Lead Agency, to pay one half the estimated cost of mitigating the significant effects of the project on any unique archaeological resources. In determining payment, the City shall give due consideration to the in-kind value of project design or expenditures that are intended to permit any or all archaeological resources or California Native American culturally significant sites to be preserved in place or left in an undisturbed state. When a final decision is made to carry out or approve the project, the City shall, if necessary, reduce the specified mitigation measures to those which can be funded with the money guaranteed by the project applicant plus the money voluntarily guaranteed by any other person or persons for those mitigation purposes. In order to allow time for interested persons to provide funding, a final decision to carry out or approve a project shall not occur sooner than sixty (60) days after completion of any required environmental documentation pursuant to applicable CEQA requirements.

5-3 - Excavation as mitigation shall be restricted to those parts of the unique archaeological resource that would be damaged or destroyed by the project. Excavation as mitigation shall not be required for a unique archaeological resource if the City determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the resource.

Implementation Responsibility: Applicant/Owner/Developer of future individual project

Monitoring Agency: City of King
Timing: During grading or construction of future individual projects

6. Geology/Soils

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities is not expected to significantly affect the geologic and soils conditions found in areas designated for these proposed future uses. Future project facilities are not expected to expose people or structures to substantial geologic risks due to rupture of a known earthquake fault, strong seismic ground shaking or seismic related ground failure. Given the relatively flat topography of areas designated for these future uses, little in the way of substantial erosion or exposure to unstable or expansive soils are expected to occur.

Mitigation Measures:

6-1 - All future structures will be required to meet the requirements of the applicable criteria contained in the City Building Code.

Implementation Responsibility: Applicant/Owner/Developer of future individual projects

Monitoring Agency: City of King

Timing: Prior to or during grading or construction of future individual projects

7. Hazards/Hazardous Materials

Impacts: Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities currently contain nine identified subsurface sites that are contaminated. These known contaminated sites as well as any unknown contaminated locations will require subsurface investigations in order to determine the need for remediation measures.

The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will not utilize or transport any hazardous materials which are capable of creating a significant hazard to the public or the environment. These proposed future uses will not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan and will not expose people or structures to significant risk of loss, injury or death involving wildfires.

Mitigation Measures:

7-1 - In the event that subsurface contamination is discovered in the review or construction phase of a project, work shall cease and the contamination shall be remediated in a manner acceptable to California Environmental Protection Agency and the California State Water Resources Control Board.

The Environstor Geotracker system can identify sites and determine what measures, if any, are required to mitigate subsurface contamination.

Implementation Responsibility: Applicant/Owner/Developer of future individual projects

Monitoring Agency: City of King

Timing: Prior to or during grading or construction of future individual projects

8. Hydrology/Water Quality

Impacts:

The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will involve grading and construction of greenhouse structures which will range in size from approximately 13.000 to 30,000 square feet.. In addition, other structures necessary to house manufacturing facilities, security offices, storage facilities and administrative offices will also be constructed

Project grading and construction may potentially impact surface stormwater quality. Developers are required to meet all measures for stormwater pollution control, waste management, and provide public utility connections that comply with the City and other service providers pursuant to the requirements of Municipal Code Section 17.56.100 Stormwater Pollution Prevention. These standards protect against stormwater pollution during grading and construction. No discharge runoff from areas devoted to cultivation will be allowed during post construction stages of each project. Given adherence to these requirements as noted below, proposed future uses will not violate any water quality standards or waste discharge requirements or substantially alter existing drainage patterns or create or contribute runoff water which would exceed the capacity of existing or planned stormwater discharge systems or otherwise degrade water quality. In addition, future project development will not place any housing within a 100-year floodplain hazard area or expose people or structures to significant loss, injury or death involving flooding. Future project facilities will not be exposed to inundation due to a seiche, tsunami or mudflow.

Mitigation Measures:

8-1 - Development shall minimize stormwater runoff by implementing one or more of the following site design measures identified by the Regional Water Quality Control Board:

(1) Direct roof runoff into cisterns or rain barrels for reuse:

(2) Direct roof runoff onto vegetated areas safely away from building foundations and footings, consistent with California Building Code;

(3) Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas safely away from building foundations and footings, consistent with the City Building Code;

(4) Direct runoff from driveways and/or uncovered parking lots onto vegetated areas safely away from building foundations and footings, consistent with City Building Code;

(5) Construct bike lanes, driveways, uncovered parking lots, sidewalks, walkways, and patios with permeable surfaces;

(6) The directing of runoff to bioretention basins and

(7) Other similar measures as identified by the City Engineer.

Implementation Responsibility: Applicant/Owner/Developer of future individual projects

Monitoring Agency: City of King

Timing: Prior to the issuance of Conditional Use Permit

9. Land Use/Planning

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will not divide an established community. As a result of the previously-approved (January, 2016) modifications to the City Zoning Code (see Section III. Project Description) and the currently proposed Zoning Code Additional Amendments, these proposed future uses will not conflict with any applicable land use plans, policies or regulations adopted by the City or any other agency that has jurisdiction over the areas designated for future project facilities nor will they conflict with any applicable habitat conservation plan or natural community conservation plan.

Mitigation Measures: Given the lack of potentially significant land use and planning impacts, no mitigation measures are required.

10. Noise

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will generate construction noise which would impact surrounding areas. Construction noise represents a short-term impact on ambient noise levels. The primary source of construction noise is heavy equipment,

including trenching equipment, trucks, graders, bulldozers, concrete mixers and portable generators that can reach high levels. The peak noise level for most of the heavy equipment that will be used during project construction is 70 to 95 dBA at a distance of 50 feet. At 200 feet, the peak construction noise levels range from 58 to 83 dBA. At 400 feet, the peak noise levels range from 52 to 77 dBA. These noise levels are based upon worst-case conditions. Typically, construction-related noise levels near the construction site will be less.

Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities are currently developed with industrial and commercial facilities and with one exception do not contain any noise sensitive uses. The sole exception is the 20-acre parcel located at the northeast intersection of First Street and Lonoak Road. Existing residential uses are located within one-quarter mile of this parcel. Any potential noise impacts upon these noise-sensitive uses can be mitigated through compliance with the City Noise Ordinance.

Mitigation Measures:

10-1 - All project construction activities shall comply with the City Noise Ordinance which limits the hours of noise-generating construction activities.

Implementation Responsibility: Applicant/Owner/Developer of future individual projects

Monitoring Agency: City of King

Timing: During grading or construction of future individual projects

11. Population and Housing

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities is estimated to require a total of 1,860 employees. This employee generation will likely generate demand for housing within or adjacent to the King City area. The extent of this additional demand is difficult to accurately estimate without knowing the number of future employees that currently reside in the area and the number of employees that will be new residents. Employees from outside the area are expected to create additional housing demand. However, this potential impact is offset by the benefits of providing employment for a significant number of local residents. Future development of proposed project facilities is not expected to result in any displacement of population or existing housing in the area.

Mitigation Measures: Given the lack of potentially significant population and housing impacts, no mitigation measures are required.

12. Public Services

Impacts: The proposed future development of medical cannabis cultivation manufacturing and testing facilities is estimated to require a total of 1,860 employees. As previously noted, this employee generation will likely generate demand for housing within or adjacent to King City. This additional housing demand, the extent of which is difficult to accurately estimate, will likely result in an incremental increase in demand for fire and police protection services as well as an indirect increase in demand for schools, parks, or other governmental facilities.

According to FEMA and the U.S. Fire Administration, indoor medical cannabis growing facilities pose safety risks for fire and emergency personnel due to the potential for inhalation of chemical fumes or the ignition of flammable materials in the event of a fire.

The cultivation of medical cannabis within buildings will require a significant amount of electrical power in order to support the cultivation operations. The two primary sources of energy demand are lighting and air conditioning. Greenhouses will either utilize mixed lighting (a combination of sunlight and artificial lighting) or all artificial lighting. It is estimated that the total maximum electrical load for lighting the entire proposed future development of medical cannabis growing facilities is 53,760 amperes. The total maximum electrical load for air conditioning the entire proposed future development of medical cannabis growing facilities is 81,468 amperes. This results in a total maximum electrical load for the entire proposed future development of medical cannabis growing facilities of 135,228 amperes. According to their representatives, Pacific Gas & Electric has recently completed major upgrade work on the transmission lines into King City and has upgraded the King City substation. They have further indicated that with these improvements, P.G. & E should have available capacity to accommodate future growth in the area.

Mitigation Measures:

12-1 – As part of the Conditional Use Permit application process, the project applicant shall submit to the City for review and approval site plans that address and reduce where feasible safety risks for fire and emergency personnel.

12-2 – As part of the Conditional Use Permit application process, the project applicant shall submit to the City of review and approval a Lighting Plan which includes the use of low energy lighting systems and other energy conserving methods.

12-3 - As part of the Conditional Use Permit application process, the project applicant shall submit to the City for review and approval a Power Plan which indicates projected power demands of the project, identifies the source of power and provides

evidence of adequate availability of power supply and sufficient infrastructure to supply the project.

Implementation Responsibility: Applicant/Owner/Developer of future individual projects

Monitoring Agency: City of King

Timing: Prior to the issuance of Conditional Use Permit

13. Recreation

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will not directly generate any additional demand for recreation facilities or services. However, these proposed future uses will likely generate additional new employees (an estimated total of 1,860 employees) that will require housing and an indirect demand for additional recreation facilities within or adjacent to the King City area. The extent of this additional demand is difficult to accurately estimate without knowing the number of future employees that currently reside in the area and the number of employees that will be new residents. Employees from outside the area are expected to indirectly generate demand for recreation facilities and services. However, this potential impact is offset by the benefits of providing employment for a significant number of local residents. Future development of the proposed project facilities is not expected to result in the substantial physical deterioration of any existing recreational facilities nor generate enough demand that would require the construction or expansion of existing recreation facilities and the provision of additional recreation services.

Mitigation Measures: Given the lack of potentially significant impacts to recreation facilities, no mitigation measures are required.

14. Transportation/Circulation

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will generate additional motor vehicle trips associated with employee travel to and from the facilities as well as occasional truck trips associated with facility operations.

It is estimated that future project development will generate a total of 3,720 vehicle trips per day. Vehicle trip generation is estimated to total 1,114 vehicle trips per day within the first year (2017) of operations and 2,316 vehicle trips per day by the year 2020.

According to the project Traffic Engineer, based on a comparison of the "per acre" trip generation rates, the proposed future development of medical cannabis growing facilities could generate daily trips in the range of 40 to 60 daily trips per acre while

the uses or combination of uses permitted under the current zoning would generate trips in the range of 51.8 to 61.17 daily trips per acre for lands designated for industrial uses and as high as 149.79 daily trips per acre for parcels designated for business park uses. Based on this comparative analysis, the proposed project use types would involve daily trip generation rates within the approximate anticipated range for uses permitted under the City's current zoning for the subject lands. As such, traffic generation totals associated the proposed future development of medical cannabis growing facilities would not generate any additional traffic -related impacts upon adjacent roadways or other street and roads in the King City area.

Future project development will be required to meet all access and parking requirements of the City.

Mitigation Measures:

14-1 - As part of the Conditional Use Permit application process, the project applicant shall submit project plans to the City for review and approval site plans which insure compliance with all access and parking requirements of the City.

Implementation Responsibility: Applicant/Owner/Developer of future individual projects

Monitoring Agency: City of King

Timing: Prior to the issuance of Conditional Use Permit

15. Utility/Service Systems

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities at full development in the year 2025 will generate demand for water as well as additional demand for wastewater treatment services. It is estimated that future project development will require a total of 193,890 gallons of water per day or 70,769,920 gallons (or 217 acre-feet) per year. This water will be used for cultivation in greenhouses and propagation in nursery facilities. Water demand is estimated to total approximately 20 million gallons (or 62 acre-feet) per year within the first year (2017) of operations and approximately 44 million gallons (or 135.5 acre-feet) per year by the year 2020. This use of irrigation water is similar to other indoor nursery crops. In addition, a minor amount of water will be needed for exterior landscaping. The California Water Service (or Cal Water) prepared an Urban Water Management Plan (UWMP) in 2015. Within the UWMP, Cal Water provided estimates of projected future water use by land use/zoning categories. The projected estimate for water demand within areas zoned Industrial (without the proposed project) totaled 72 acre-feet in the year 2020 and 76 acre-feet in the year 2025. Projected project water demands for proposed future development of medical cannabis growing facilities, therefore, represent a 188% increase in industrial water demand in 2020 and a 285% increase in 2025. According to well level records, the groundwater level in the King City area has been relatively consistent over time.

It is estimated that future project development will generate a total of 16,393 gallons (or 16.4 MGD) of wastewater per day or 5,983,528 gallons (or 5.98 MGD) of wastewater per year. This wastewater will contain a variety of nutrients typically found in commercial nursery facilities. Wastewater generation is estimated to total approximately 1.80 million gallons per year within the first year (2017) of operations and approximately 3.78 million gallons per year by the year 2020.

The City Public Works Department has indicated that the chemicals and nutrients contained in the wastewater generated by individual projects are common to wastewater released from other typical wastewater sources. It should also be noted that the City Public Works Department samples wastewater on a daily basis, provides samples to a testing laboratory weekly and performs a wastewater audit twice a year. Given this level of monitoring coupled with the anticipated dilution of wastewater generated by these projects, the City does not anticipate any major issues with wastewater treatment.

Individual projects will also be required to submit project plans to the City in order to assess individual project water demands in relation to the available water supplies and infrastructure and individual project wastewater generation in relation to the existing wastewater transmission and treatment facilities at that time. In addition, individual projects will also be responsible for the extension of public water system lines to their project facilities.

Mitigation Measures:

15-1 - As part of the Conditional Use Permit application process, the project applicant shall submit to the City for review and approval a Water Plan which indicates projected water demands of the project, identifies the source of water and provides evidence of adequate availability of water supply and sufficient infrastructure to supply the project.

15-2 - As part of the Conditional Use Permit application process, the project applicant shall submit site plans to the City for review and approval which indicate projected wastewater generation of the project, identifies the existing wastewater transmission and treatment facilities and provides evidence of sufficient wastewater transmission facilities and treatment capacity to serve the project.

15-3 - The proposed future development of medical cannabis growing facilities shall be required to extend public water system lines to the project facilities as needed.
Implementation Responsibility: Applicant/Owner/Developer of future individual projects

Monitoring Agency: City of King

Timing: Prior to the issuance of Conditional Use Permit

III. PROJECT DESCRIPTION

In January, 2016, the City of King (or "City") approved several modifications to : 1) the General Industrial ("M-1" and "M-2") zoning designations; 2) the East Ranch Business Park Specific Plan ("ERBP-SP"), and 3) changed the M-1 zoning in the ERBP-SP to Planned Development District ("PD"). These zoning changes allowed, through the approval and issuance of Conditional Use Permits ("CUP's"), the cultivation of medical cannabis. At that time, the City also prepared an Initial Study ("IS") and Mitigated Negative Declaration ("MND") which examined the potential environmental impacts of these proposed actions. The areas zoned M-1 and the ERBP-SP are located in the northeast corner of the City near the Mesa del Rey Airport. The areas zoned M-2 are located east of the airport and near the corner of First Street and Lonoak Road.

Table 1, Zoning Breakdowns, provides a listing of the various zoned parcels noted above.

TABLE 1
ZONING BREAKDOWNS

Parcel	Zoning	Acres	Location
East Ranch Business Park Specific Plan (ERBP-SP)	Specific Plan	107	Northeast corner of the City
Areas Adjacent to ERBP	M-1	20	Adjacent to and northeast Of ERBP
Adjacent to Mesa del Rey Airport	M-2	40	Adjacent to Mesa del Rey Airport
First Street and Lonoak Road	M-2	20	Northeast of the Intersection of First Street And Lonoak Road

These approved zoning modifications establish a mechanism for local level regulation allowing the cultivation of medical cannabis within buildings and/or greenhouse structures at locations approved by the City with a Conditional Use Permit. These approved zoning modifications, which became effective in February 2016, allow the commercial cultivation of medical cannabis on a large scale basis. All other commercial cannabis activity, including but not limited to cultivation (other than cultivation allowed by these zoning regulations) delivery, dispensaries, distribution, manufacturing or transporting (other than to transport cultivated product outside of the jurisdictional boundaries of the City) are strictly prohibited. These approved

zoning regulations do not apply to nor allow the personal cultivation and/or use of cannabis nor the sale of such products within the City.

B. Project Characteristics

1. Zoning Code Amendments

Since the approval of the zoning modifications noted above, the City has proposed amendments to various zoning ordinances, including City Ordinance Section 17.03 (general cannabis discussions), Section s 17.30.020 and 17.31.020 governing the M-1 and M-2 zoning designations and the ordinance governing the East Ranch Business Park. These additional zoning code amendments are intended to more specifically design and regulate any proposed facilities associated with medical cannabis cultivation, manufacturing and testing. Listed below are the various categories (or types) of facilities that will require permits from the City.

Type 2A	All Artificial Light Structures, maximum 10,000 s.f.
Type 2B	Mixed Light Structure, maximum 10,000 s.f.
Type 3A	All Artificial Light Structure, maximum 22,000 s.f.
Type 3B	Mixed Light Structure, maximum 22,000 s.f.
Type 4	Nursery
Type 6	Manufacturing
Type 8	Testing

2. Future Development of Medical Cannabis Growing Facilities

The City has not received any development applications at this time for medical cannabis growing facilities. In order to fully assess the potential environmental impacts associated with the proposed zoning code additions/amendments, the City has estimated the nature and extent of additional medical cannabis growing facilities. This estimate of future medical cannabis growing facilities within the City, as listed below, is intended to provide the basis for the maximum probable ("worst-case") assessments of potential impacts of the cumulative development of these facilities within this document.

- 4 Type 2A (all artificial light) greenhouse buildings (10,000 square foot plant canopy within a 13,000 square foot structure)
- 13 Type 2B (mixed light) greenhouse buildings (10,000 square foot plant canopy within a 13,000 square foot structure)
- 8 Type 3A (all artificial light) greenhouse buildings (22,000 square foot plant canopy within a 28,000 to 30,000 square foot structure)
- 34 Type 3B (mixed light) greenhouse buildings (22,000 square foot plant canopy within a 28,000 to 30,000 square foot structure)
- 6 Manufacturing Facilities
- 4 Nurseries (25,000 s.f.)

- 4 Security Offices
- 6 Plantonics Stores and Storage Facilities
- 4 Executive and Administrative Offices

(Note: The Type 2A and 3A greenhouse buildings are allowed pursuant to the previously approved (January, 2016) zoning modifications discussed above but are included in order to provide the maximum probable ("worst-case") assessments of potential project impacts).

Type 2 greenhouse structures will cover a total of 13,000 square feet. Of this total, 10,000 square feet will be devoted to cannabis growing areas. Type 3 greenhouse structures will cover a total of 28,000 to 30,000 square feet. Of this total, 22,000 square feet will be devoted to cannabis growing areas. An additional 3,000 square feet in Type 2 greenhouses and an additional 6,000 to 8,000 square feet in Type 3 structures which will be devoted to the following functions: 1) trimming room, 2) drying room, 3) watering and mixing station, and 4) office space, bathrooms and employee break area. In addition, Type 2 greenhouses will have approximately 9,000 square feet devoted to exterior landscaping and parking while Type 3 greenhouses will have approximately 12,000 to 15,000 square feet devoted to exterior landscaping and parking. The greenhouse buildings will have glass roofs and side walls consisting of solid materials (i.e. brick, metal, wood, etc.) in order to provide security and eliminate a potential attractive nuisance.

Lighting will be provided by natural sunlight and/or artificial lighting. Artificial lighting will utilize energy efficient lighting systems with a finely tuned light spectrum which promotes the highest possible plant production rates. Type 2 greenhouses will have approximately 400 lights while Type 3 greenhouses will have 880 lights and Type 4 nurseries will have 1,000 lights.

Power use is primarily associated with lighting and cooling of the greenhouse structures. It is estimated that the total maximum electrical load for lighting the entire proposed future development of medical cannabis facilities is 53,760 amperes. The total maximum electrical load for air conditioning the entire proposed future development of medical cannabis facilities is 81,468 amperes. This results in a total maximum electrical load for the entire proposed future development of medical cannabis facilities of 135,228 amperes.

It is estimated that future project development will require a total of 193,890 gallons of water per day or 70,769,920 gallons (or 217 acre-feet) per year. This water will be used for cultivation in greenhouses and propagation in nursery facilities. Water demand is estimated to total approximately 20 million gallons (or 62 acre-feet) per year within the first year (2017) of operations and approximately 44 million gallons (or 135.5 acre-feet) by the year 2020. It is estimated that future project development will generate a total of 16,393 gallons (or 16.4 MGD) of wastewater per day or 5,983,528 gallons (or 5.98 MGD) of wastewater per year. This wastewater will

contain a variety of nutrients typically found in commercial nursery facilities. Wastewater generation is estimated to total approximately 1.80 million gallons per year within the first year (2017) of operations and approximately 3.78 million gallons per year by the year 2020.

It is estimated that the development of all future medical cannabis growing facilities will generate a total 3,720 vehicle trips per day. Vehicle trip generation is estimated to total 1,114 vehicle trips per day within the first year (2017) of operations and 2,316 vehicle trips per day the year 2020.

This Initial Study/Mitigated Negative Declaration has been prepared in a manner which provides complete and adequate California Environmental Quality Act (CEQA) coverage for all actions and approvals associated with the proposed project as currently described herein. However, this Initial Study/Mitigated Negative Declaration may not be the final environmental document for the proposed project. In the event that future development applications for the commercial cultivation of medical cannabis contain specific design or operational elements not addressed by this Initial Study, additional, more detailed environmental documentation may be necessary at that time. When applications for individual projects are submitted, they will be subject to additional environmental review by the City in order to 1) determine the nature and extent of any potentially significant impacts not addressed in this document and 2) insure that the individual project does not exceed the maximum development levels and cumulative impacts identified in this analysis. These individual projects will be approved by the City through the approval and issuance of Conditional Use Permits ("CUP's"),

IV. EXISTING CONDITIONS

The City of King is located in the southern end of Salinas Valley along the US Highway 101 approximately in the center of Monterey County. King City is the hub of the southern part of the agricultural industry of the Salinas Valley. The Salinas Valley is one of the most productive agricultural valleys in the world, producing many of the fruits and vegetables consumed throughout the United States. It is also at the northern edge of the Paso Robles Wine Region. The Highway 101 corridor connects the San Francisco Bay Area and the Central Coast.

The City is approximately 50 miles south of the City of Salinas, 150 miles south of San Francisco, 105 miles south of San Jose, 50 miles north of Paso Robles and 300 miles north of Los Angeles. The City of King is important for its proximity to Pinnacles National Park and as the hub of the south Salinas Valley agricultural center. It is a relatively small agriculture-based community located south of the small towns of Greenfield, Soledad, and Gonzales, other agricultural communities in the Salinas Valley.

The topography of the City and surrounding valley is flat alluvial plane between mountain ranges to the east and west of the City. San Lorenzo Creek and Salinas River floodplains are a potential hazard, bordering the southwestern portion of the City and traversing the City in a northeasterly direction to intersect the Salinas River. The City is located near the border of the Pacific and Continental Plates and is within an area known to have frequent seismic movement.

The properties covered impacted by the proposed cultivation of medical cannabis are located in the northeastern and eastern parts of the City. The area affected is partially developed with industrial and commercial uses, with numerous interspersed vacant properties. Approximately 75 percent of the area is developed. Surrounding land uses generally include agricultural uses to the north and east and commercial, industrial and residential uses to the south and west. The area has an existing street system providing access to major transportation corridors such as Highway 101. Products from the cultivated medical cannabis facilities would likely be shipped to processing facilities located in other areas of the State.

V. ENVIRONMENTAL EVALUATION

The environmental factors checked below would be potentially affected by the proposed project, involving at least one impact that is a "Significant", "Unknown Potential Significant" or "Potential Significant and Mitigated" Impact as indicated by the Environmental Checklist:

X	1. Aesthetics			9. Land Use/Planning
	2. Agricultural Resources		X	10. Noise
X	3. Air Quality/Greenhouse Gas Emissions			11. Population/Housing
	4. Biological Resources		X	12. Public Services
X	5. Cultural Resources			13. Recreation
X	6. Geology/Soils		X	14. Transportation/Circulation
X	7. Hazards/Hazardous Materials		X	15. Utility/Service Systems
X	8. Hydrology/Water Quality			16. Mandatory Findings of Significance

The following checklist indicates the potential level of impact and based upon the following categories:

Known Significant: Known significant environmental impacts.

Unknown Potentially Significant: Unknown potentially significant impacts, which require further review to determine significance level.

Potentially Significant and Mitigable: Potentially significant impacts which can be mitigated to less than significant levels.

Not Significant: Impacts which are not considered significant.

Impact Reviewed in Previous Document: Adequate previous analysis exists regarding the issue; further analysis is not required due to tiering process (Section 21094 of CEQA and Section 15162 of the State CEQA Guidelines). Discussion should include reference to the previous documents and identification of mitigation measures incorporated from those previous documents. Where applicable, this box should be checked in addition to one indicating significance of the potential environmental impact.

1.	AESTHETICS: Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Have a substantial adverse effect on a scenic vista?				X	
b.	Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within view of a state scenic highway?				X	
c.	Substantially degrade the existing visual character or quality of the site and its surroundings?			X		
d.	Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?			X		

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will involve the construction of greenhouse structures which will range in size from approximately 13,000 to 30,000 square feet. The greenhouse buildings will have glass roofs and sidewalls consisting of solid materials (i.e., brick, metal, wood, etc.).

In addition, other structures necessary to house manufacturing facilities, security offices, storage facilities and administrative offices will also be constructed.

All structures and other project facilities will be subject to the City's design standards applicable to the M-1 and M-2 zoning or the East Ranch Business Park. These proposed facilities will also be visually compatible with the existing industrial and commercial uses in adjacent areas.

None of the proposed structures or other project facilities will have a substantial adverse effect upon any scenic vistas or scenic resources nor will they degrade the visual character or quality of the site or its surroundings.

Lighting within the greenhouses will be provided by natural sunlight and/or artificial lighting systems. All lighting shall be directed downward and oriented in a manner to mitigate potential light and glare impacts upon surrounding areas.

Mitigation Measures:

1-1 – All proposed project structures and facilities shall be subject to the City's design standards applicable to the M-1 and M-2 zoning or the East Ranch Business Park.

1-2 –As part of the Conditional Use Permit application process, the project applicant shall submit to the City for review and approval a Lighting Plan which describes all proposed interior and exterior lighting and provides feasible methods by which all light is directed downward which prevents substantial light and glare impacts to adjacent areas.

2.	AGRICULTURAL RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed In Previous Document

a.	Convert prime farmland, unique farmland, or farmland of statewide importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X	
b.	Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X	
c.	Involve other changes in the existing environment, which, due to their location or nature could result in conversion of farmland, to non-agricultural use?				X	

Impacts: Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities are either developed or highly disturbed and do not contain existing agricultural operations nor any areas designated as prime farmland, unique farmland, or farmland of statewide importance. These proposed future uses will, therefore, not conflict with any areas zoned for agricultural use or covered by a Williamson Act contract nor will they result in any conversion of existing farmland to non-agricultural use.

Mitigation Measures: Given the lack of potentially significant impacts to agricultural resources, no mitigation measures are required.

3.	AIR QUALITY/GREENHOUSE GAS EMISSIONS Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Conflict with or obstruct implementation of the applicable air quality plan?				X	
b.	Exposure of sensitive receptors to substantial pollution concentrations (emissions from direct, indirect, mobile and stationary sources)?				X	
c.	Violate any air quality standard or contribute substantially to an existing or projected air quality violation?				X	
d.	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?				X	
e.	Create objectionable smoke, ash, dust or odors affecting a substantial number of people?			X		
f.	Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?				X	
g.	Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?				X	

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will generate additional motor vehicle trips

associated with employee travel to and from the facilities as well as occasional truck trips associated with facility operations. This generation of additional motor vehicle trips is not expected to conflict with any applicable air quality plans or regulations or violate any established air quality standards or substantially contribute to a projected air quality violation. These proposed future uses will not result in any cumulative net increase of any pollutant for which the region is in non-attainment.

The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will not generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment nor will they conflict with any applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Medical cannabis cultivation, manufacturing and testing facilities have the potential to generate odors that can become a source of complaints from local residents adjacent to the facility. The high degree of humidity and moisture required for the cultivation and production of medical cannabis can result in the generation of mold.

Mitigation Measures:

3-1 – All proposed project structures and facilities shall be subject to permit conditions that monitor and prevent the production of odors outside of the building as well as the monitoring and prevention of mold within and near the buildings by the inclusion of air filters, recirculation of internal air or other appropriate means of filtering odors that may otherwise escape from the subject facilities.

4.	BIOLOGICAL RESOURCES Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				X	
b.	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife service?				X	
c.	Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc) through direct removal, filling, hydrological interruption, or other means?				X	
d.	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?				X	

e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X	
f.	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?				X	

Impacts: Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities are either developed or highly disturbed and do not include areas containing any rare or endangered plant or animal species. These proposed future uses will, therefore, not result in any modification to sensitive biological habitats nor will they impact any species identified as a candidate, sensitive or special status species. No significant impacts to existing riparian habitats or other sensitive natural communities, Federally protected wetlands, or established migratory wildlife corridors are anticipated. Future project facilities will not conflict with any local policies or ordinances protecting biological resources or provisions of any approved local, regional or state habitat conservation plan.

Mitigation Measures: Given the lack of potentially significant impacts to biological resources, no mitigation measures are required.

5. CULTURAL RESOURCES Would the project:		Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed In Previous Document
a.	Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5?			X		
b.	Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?			X		
c.	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?			X		
d.	Disturb any human remains, including those interred outside of formal cemeteries?			X		

Impacts: Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities are either highly developed or highly disturbed and do not contain any known archaeological sites, paleontological resources or historical structures.

However, significant archaeological, paleontological or historic resources may be discovered during project grading or construction. In that event, these resources will either be excavated or protected in a manner consistent with all applicable State and local laws, and all work will be halted and the resources will be evaluated by a qualified professional.

Mitigation Measures:

5-1 - In the event of an accidental discovery or recognition of any human remains, archaeological resources, paleontological resources or historical resources on the

project site, if said resources are found during excavation or construction, work will be halted at a minimum of 30 feet from the find and the area will be staked off. There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie cultural resources, paleontological resources, historical resources or, in the case of adjacent human remains until the coroner of Monterey County is contacted to determine that no investigation of the cause of death is required. If the coroner determines the remains to be Native American, the coroner shall contact the Native American Heritage Commission within 24 hours. A qualified professional (to be hired by the applicant and accepted by the City) in cultural resources, paleontological resources or historical resources shall evaluate the resources discovered at the site and provide recommendations for disposition of those resources. In the case of human remains, the Native American Heritage Commission shall identify the person or persons it believes to be the most likely descendent ("MLD") from the deceased Native American. The MLD may then make recommendations to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and associated grave goods as provided in Public Resources Code Section 5097.98. The landowner or it's authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further disturbance if: a) the Native American Heritage Commission is unable to identify a MLD or the MLD failed to make a recommendation within 24 hours after being notified by the commission; b) the descendent identified fails to make a recommendation; or c) the landowner or it's authorized representative rejects the recommendation of the descendent, and the mediation by the Native American Heritage Commission fails to provide measures acceptable to the landowner.

5-2 – Pursuant to CEQA requirements, mitigation measures shall be required in the event that unique archaeological resources are not preserved in place or not left in an undisturbed state. The project applicant shall provide a guarantee to the City, as Lead Agency, to pay one half the estimated cost of mitigating the significant effects of the project on any unique archaeological resources. In determining payment, the City shall give due consideration to the in-kind value of project design or expenditures that are intended to permit any or all archaeological resources or California Native American culturally significant sites to be preserved in place or left in an undisturbed state. When a final decision is made to carry out or approve the project, the City shall, if necessary, reduce the specified mitigation measures to those which can be funded with the money guaranteed by the project applicant plus the money voluntarily guaranteed by any other person or persons for those mitigation purposes. In order to allow time for interested persons to provide funding, a final decision to carry out or approve a project shall not occur sooner than sixty (60) days after completion of any required environmental documentation pursuant to applicable CEQA requirements.

5-3 - Excavation as mitigation shall be restricted to those parts of the unique archaeological resource that would be damaged or destroyed by the project. Excavation as mitigation shall not be required for a unique archaeological resource if

the City determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the resource.

6.	GEOLOGY /SOILS Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant or Not Applicable	Impact Reviewed in Previous Document
a.	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:			X		
i)	Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist or based on other substantial evidence of a known fault (Refer to Division of Mines and Geology Publication 42)				X	
ii)	Strong seismic ground shaking?			X		
iii)	Seismic-related ground failure, including liquefaction?				X	
iv)	Landslides?				X	
b.	Result in substantial erosion or the loss of topsoil?				X	
c.	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				X	
d.	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X	
e.	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X	

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities is not expected to significantly affect the geologic and soils conditions found in areas designated for these proposed future uses. Future project facilities are not expected to expose people or structures to substantial geologic risks due to rupture of a known earthquake fault, strong seismic ground shaking or seismic related ground failure. Given the relatively flat topography of areas designated for these future uses, little in the way of substantial erosion or exposure to unstable or expansive soils are expected to occur.

Mitigation Measures:

6-1 - All future structures will be required to meet the requirements of the applicable criteria contained in the City Building Code.

7.	HAZARDS/HAZARDOUS MATERIALS Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?				X	

b.	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				X	
c.	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X	
d.	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment?			X		
e.	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X	
f.	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X	

Impacts: Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities currently contain nine identified subsurface sites that are contaminated. These known contaminated sites as well as any unknown contaminated locations will require subsurface investigations in order to determine the need for remediation measures.

The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will not utilize or transport any hazardous materials which are capable of creating a significant hazard to the public or the environment. These proposed future uses will not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan and will not expose people or structures to significant risk of loss, injury or death involving wildfires.

Mitigation Measures:

7-1 - In the event that subsurface contamination is discovered in the review or construction phase of a project, work shall cease and the contamination shall be remediated in a manner acceptable to California Environmental Protection Agency and the California State Water Resources Control Board. The Environstor Geotracker system can identify sites and determine what measures, if any, are required to mitigate subsurface contamination.

8.	HYDROLOGY/WATER QUALITY Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Violate any water quality standards or waste discharge requirements?				X	

b.	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X	
c.	Substantially alter the existing drainage pattern on the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off-site?				X	
d.	Substantially alter the existing drainage pattern on the site or area, including through the alteration of the course of a stream or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site?			X		
e.	Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff or fail to meet the new CCRWQCB standards for stormwater control?			X		
f.	Otherwise substantially degrade water quality?				X	
g.	Place housing within a 100-year flood hazard area as mapped on a federal flood hazard boundary or flood insurance rate map or other flood hazard delineation map?				X	
h.	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X	
i.	Inundation by seiche, tsunami, or mudflow?				X	

Impacts:

The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will involve grading and construction for greenhouse structures which will range in size from approximately 13,000 to 30,000 square feet. In addition, other structures necessary to house manufacturing facilities, security offices, storage facilities and administrative offices will also be constructed

Project grading and construction may potentially impact surface stormwater quality. Developers are required to meet all measures for stormwater pollution control, waste management, and provide public utility connections that comply with the City and other service providers pursuant to the requirements of Municipal Code Section 17.56.100 Stormwater Pollution Prevention. These standards protect against stormwater pollution during the grading and construction. No discharge runoff from areas devoted to cultivation will be allowed during post construction stages of each project. Given adherence to these requirements as noted below, proposed future uses will not violate any water quality standards or waste discharge requirements or substantially alter existing drainage patterns or create or contribute runoff water which would exceed the capacity of existing or planned stormwater discharge systems or otherwise degrade water quality. In addition, future project development will not place any housing within a 100-year floodplain hazard area or expose people or structures to significant loss, injury or death involving flooding. Future project facilities will not be exposed to inundation due to a seiche, tsunami or mudflow.

Mitigation Measures:

8-1 - Development shall minimize stormwater runoff by implementing one or more of the following site design measures identified by the Regional Water Quality Control Board:

(1) Direct roof runoff into cisterns or rain barrels for reuse:

(2) Direct roof runoff onto vegetated areas safely away from building foundations and footings, consistent with California Building Code;

(3) Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas safely away from building foundations and footings, consistent with the City Building Code;

(4) Direct runoff from driveways and/or uncovered parking lots onto vegetated areas safely away from building foundations and footings, consistent with City Building Code;

(5) Construct bike lanes, driveways, uncovered parking lots, sidewalks, walkways, and patios with permeable surfaces;

(6) The directing of runoff to bioretention basins and

(7) Other similar measures as identified by the City Engineer.

9.	LAND USE AND PLANNING Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Physically divide an established community?				X	
b.	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				X	
c.	Conflict with any applicable habitat conservation plan or natural community conservation plan?				X	

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will not divide an established community. As a result of the previously-approved (January, 2016) modifications to the City Zoning Code (see Section III. Project Description) and the currently proposed Zoning Code Additional Amendments, these proposed future uses will not conflict with any applicable land use plans, policies or regulations adopted by the City or any other agency that has jurisdiction over the areas designated for future project facilities nor will they conflict with any applicable habitat conservation plan or natural community conservation plan.

Mitigation Measures: Given the lack of potentially significant land use and planning impacts, no mitigation measures are required.

10.	NOISE Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Expose people to, or generate, noise levels exceeding established standards in the local general plan, coastal plan, noise ordinance or other applicable standards of other agencies?			X		
b.	Expose persons to or generate excessive ground borne vibration or ground borne noise levels?			X		
c.	Cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X	
d.	Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?				X	

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will generate construction noise which would impact surrounding areas. Construction noise represents a short-term impact on ambient noise levels. The primary source of construction noise is heavy equipment, including trenching equipment, trucks, graders, bulldozers, concrete mixers and portable generators that can reach high levels. The peak noise level for most of the heavy equipment that will be used during project construction is 70 to 95 dBA at a distance of 50 feet. At 200 feet, the peak construction noise levels range from 58 to 83 dBA. At 400 feet, the peak noise levels range from 52 to 77 dBA. These noise levels are based upon worst-case conditions. Typically, construction-related noise levels near the construction site will be less.

Areas designated for future development of medical cannabis cultivation, manufacturing and testing facilities are currently developed with industrial and commercial facilities and with one exception do not contain any noise sensitive uses. The sole exception is the 20-acre parcel located at the northeast intersection of First Street and Lonoak Road. Existing residential uses are located within one-quarter mile of this parcel. Any potential noise impacts upon these noise-sensitive uses can be mitigated through compliance with the City Noise Ordinance.

Mitigation Measures:

10-1 - All project construction activities shall comply with the City Noise Ordinance which limits the hours of noise-generating construction activities.

11. POPULATION AND HOUSING Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document

a.	Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X	
b.	Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X	
c.	Induce substantial growth in an area either directly (for example, by proposing new homes and businesses) or indirectly (e.g. through extension of roads or other infrastructure)?				X	

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities is estimated to require a total of 1,860 employees. This employee generation will likely generate demand for housing within or adjacent to the King City area. The extent of this additional demand is difficult to accurately estimate without knowing the number of future employees that currently reside in the area and the number of employees that will be new residents. Employees from outside the area are expected to create additional housing demand. However, this potential impact is offset by the benefits of providing employment for a significant number of local residents. Future development of proposed project facilities is not expected to result in any displacement of population or existing housing in the area.

Mitigation Measures: Given the lack of potentially significant population and housing impacts, no mitigation measures are required.

12. PUBLIC SERVICES Would the project result in a substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the following public services:		Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Fire protection?			X		
b.	Police protection?				X	
c.	Schools?				X	
d.	Parks or other recreational facilities?				X	
e.	Other governmental services? (Power)			X		

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities is estimated to require a total of 1,860 employees. As previously noted, this employee generation will likely generate demand for housing within or adjacent to King City. This additional housing demand, the extent of which is difficult to accurately estimate, will likely result in an incremental increase in demand for fire and police protection services as well as an indirect increase in demand for schools, parks, or other governmental facilities.

According to FEMA and the U.S. Fire Administration, indoor medical cannabis growing facilities pose safety risks for fire and emergency personnel due to the

potential for inhalation of chemical fumes or the ignition of flammable materials in the event of a fire.

The cultivation of medical cannabis within buildings will require a significant amount of electrical power in order to support the cultivation operations. The two primary sources of energy demand are lighting and air conditioning. Greenhouses will either utilize mixed lighting (a combination of sunlight and artificial lighting) or all artificial lighting. It is estimated that the total maximum electrical load for lighting the entire proposed future development of medical cannabis growing facilities is 53,760 amperes. The total maximum electrical load for air conditioning the entire proposed future development of medical cannabis growing facilities is 81,468 amperes. This results in a total maximum electrical load for the entire proposed future development of medical cannabis growing facilities of 135,228 amperes. According to their representatives, Pacific Gas & Electric has recently completed major upgrade work on the transmission lines into King City and has upgraded the King City substation. They have further indicated that with these improvements, P.G. & E should have available capacity to accommodate future growth in the area.

Mitigation Measures:

12-1 – As part of the Conditional Use Permit application process, the project applicant shall submit to the City for review and approval site plans that address and reduce where feasible safety risks for fire and emergency personnel.

12-2 – As part of the Conditional Use Permit application process, the project applicant shall submit to the City of review and approval a Lighting Plan which includes the use of low energy lighting systems and other energy conserving methods.

12-3 - As part of the Conditional Use Permit application process, the project applicant shall submit to the City for review and approval a Power Plan which indicates projected power demands of the project, identifies the source of power and provides evidence of adequate availability of power supply and sufficient infrastructure to supply the project.

13. RECREATION Would the project:		Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X	
b.	Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?				X	

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will not directly generate any additional demand for recreation

facilities or services. However, these proposed future uses will likely generate additional new employees (an estimated total of 1,860 employees) that will require housing and an indirect demand for additional recreation facilities within or adjacent to the King City area. The extent of this additional demand is difficult to accurately estimate without knowing the number of future employees that currently reside in the area and the number of employees that will be new residents. Employees from outside the area are expected to indirectly generate demand for recreation facilities and services. However, this potential impact is offset by the benefits of providing employment for a significant number of local residents. Future development of the proposed project facilities is not expected to result in the substantial physical deterioration of any existing recreational facilities nor generate enough demand that would require the construction or expansion of existing recreation facilities and the provision of additional recreation services.

Mitigation Measures: Given the lack of potentially significant impacts to recreation facilities, no mitigation measures are required.

14. TRANSPORTATION/CIRCULATION Would the project:		Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a.	Cause an increase in traffic, which is substantial in relation to the existing traffic load and capacity of the street system (i.e. result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?				X	
b.	Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?				X	
c.	Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?			X		
d.	Substantially increase hazards due to a design feature (e.g. limited sight visibility, sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment)?				X	
e.	Result in inadequate emergency access?			X		
f.	Result in inadequate parking capacity?			X		
g.	Conflicts with adopted policies supporting alternative transportation (e.g. bus turnouts, bicycle racks)?				X	

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities will generate additional motor vehicle trips associated with employee travel to and from the facilities as well as occasional truck trips associated with facility operations.

It is estimated that future project development will generate a total of 3,720 vehicle trips per day. Vehicle trip generation is estimated to total 1,114 vehicle trips per day within the first year (2017) of operations and 2,316 vehicle trips per day by the year 2020.

According to the project Traffic Engineer, based on a comparison of the "per acre" trip generation rates, the proposed future development of medical cannabis growing facilities could generate daily trips in the range of 40 to 60 daily trips per acre while the uses or combination of uses permitted under the current zoning would generate trips in the range of 51.8 to 61.17 daily trips per acre for lands designated for industrial uses and as high as 149.79 daily trips per acre for parcels designated for business park uses. Based on this comparative analysis, the proposed project use types would involve daily trip generation rates within the approximate anticipated range for uses permitted under the City's current zoning for the subject lands. As such, traffic generation totals associated the proposed future development of medical cannabis growing facilities would not generate any additional traffic -related impacts upon adjacent roadways or other street and roads in the King City area.

Future project development will be required to meet all access and parking requirements of the City.

Mitigation Measures:

14-1 - As part of the Conditional Use Permit application process, the project applicant shall submit project plans to the City for review and approval site plans which insure compliance with all access and parking requirements of the City.

15. UTILITIES & SERVICE SYSTEMS Would the project:		Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?			X		
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X	
c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X	
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?			X		
e. Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?			X		
f. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?				X	
g. Comply with federal, state, and local statutes and regulations related to solid waste?				X	

Impacts: The proposed future development of medical cannabis cultivation, manufacturing and testing facilities at full development in the year 2025 will generate demand for water as well as additional demand for wastewater treatment services. It is estimated that future project development will require a total of 193,890 gallons of water per day or 70,769,920 gallons (or 217 acre-feet) per year. This water will be used for cultivation in greenhouses and propagation in nursery facilities. Water demand is estimated to total approximately 20 million gallons (or 62 acre-feet) per year within the first year (2017) of operations and approximately 44 million gallons (or 135.5 acre-feet) per year by the year 2020. This use of irrigation water is similar to other indoor nursery crops. In addition, a minor amount of water will be needed for exterior landscaping. The California Water Service (or Cal Water) prepared an Urban Water Management Plan (UWMP) in 2015. Within the UWMP, Cal Water provided estimates of projected future water use by land use/zoning categories. The projected estimate for water demand within areas zoned Industrial (without the proposed project) totaled 72 acre-feet in the year 2020 and 76 acre-feet in the year 2025. Projected project water demands for proposed future development of medical cannabis growing facilities, therefore, represent a 188% increase in industrial water demand in 2020 and a 285% increase in 2025. According to well level records, the groundwater level in the King City area has been relatively consistent over time.

It is estimated that future project development will generate a total of 16,393 gallons (or 16.4 MGD) of wastewater per day or 5,983,528 gallons (or 5.98 MGD) of wastewater per year. This wastewater will contain a variety of nutrients typically found in commercial nursery facilities. Wastewater generation is estimated to total approximately 1.80 million gallons per year within the first year (2017) of operations and approximately 3.78 million gallons per year by the year 2020.

The City Public Works Department has indicated that the chemicals and nutrients contained in the wastewater generated by individual projects are common to wastewater released from other typical wastewater sources. It should also be noted that the City Public Works Department samples wastewater on a daily basis, provides samples to a testing laboratory weekly and performs a wastewater audit twice a year. Given this level of monitoring coupled with the anticipated dilution of wastewater generated by these projects, the City does not anticipate any major issues with wastewater treatment.

Individual projects will also be required to submit project plans to the City in order to assess individual project water demands in relation to the available water supplies and infrastructure and individual project wastewater generation in relation to the existing wastewater transmission and treatment facilities at that time. In addition, individual projects will also be responsible for the extension of public water system lines to their project facilities.

Mitigation Measures:

15-1 - As part of the Conditional Use Permit application process, the project applicant shall submit to the City for review and approval a Water Plan which indicates projected water demands of the project, identifies the source of water and provides evidence of adequate availability of water supply and sufficient infrastructure to supply the project.

15-2 - As part of the Conditional Use Permit application process, the project applicant shall submit site plans to the City for review and approval which indicate projected wastewater generation of the project, identifies the existing wastewater transmission and treatment facilities and provides evidence of sufficient wastewater transmission facilities and treatment capacity to serve the project.

15-3 - The proposed future development of medical cannabis growing facilities shall be required to extend public water system lines to the project facilities as needed.

THIS PAGE LEFT INTENTIONALLY BLANK

VI. MANDATORY FINDINGS OF SIGNIFICANCE

A project may have a significant effect on the environment and thereby require an focused or full environmental impact report to be prepared for the project where any of the following conditions occur (CEQA §15065):

	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
Potential to degrade: Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?				X	
Cumulative: Does the project have impacts that are individually limited but cumulatively considerable? (Cumulatively considerable means that incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?				X	
Substantial adverse: Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?				X	

a. The proposed future development of medical cannabis growing facilities does not have the potential to substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of an endangered, rare, or threatened species. It is possible during grading and construction activities that unknown cultural resources may be unearthed, which may result in a potentially significant impact. Implementation of the mitigation measures for Cultural Resources would ensure the proposed project would not eliminate important examples of the major periods of California history or prehistory.

b. Construction-related activities of the proposed future medical cannabis growing facilities have the potential to generate storm-related runoff pollutants. These future projects will be required to prepare a plan that addresses all potential pollutants, including but not limited to soil erosion and sediment which shall be followed during grading and construction as well as maintained for the entire term of their use. Other measures to address the protection against all subsurface and surface pollution shall also be implemented during construction and for the full duration of the use of the properties.

c. The proposed future development of medical cannabis growing facilities could potentially result in the generation of construction dust and equipment exhaust emissions and noise will be required to reduce air quality and noise impacts to less than significant levels.

THIS PAGE LEFT INTENTIONALLY BLANK

VII. ENVIRONMENTAL DETERMINATION

On the basis of the facts contained within this Initial Study:

I find that the proposed project COULD NOT have a significant effect on the environment and a NEGATIVE DECLARATION will be prepared.	☐
I find that although the project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described in this document have been added to the project. A NEGATIVE DECLARATION will be prepared.	☒
I find that the project MAY have a significant effect on the environment and an ENVIRONMENTAL IMPACT REPORT is required.	☐
I find that the project MAY have a significant effect(s) on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards and 2) has been addressed by mitigation measures based on an earlier analysis. If the effect is a potentially significant impact or potentially significant unless mitigated, an ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that need to be addressed.	☐
I find that although the proposed project could have a significant effect on the environment, there WILL NOT be a significant effect in this case because all potentially significant effects (a) have been analyzed adequately in an earlier EIR pursuant to applicable standards and (b) have been avoided or mitigated pursuant to that earlier EIR, including project revisions or mitigation measures that are imposed upon the proposed project.	☐

8/25/16

Steven Adams
City Manager
City of King

Date

THIS PAGE LEFT INTENTIONALLY BLANK

VIII. CERTIFICATION

I hereby affirm to the best of my knowledge, based on available information provided to me through specialist's technical reports, public documents and original research, analysis and assessments, the statements and information contained within this environmental document are true and correct to the degree of accuracy necessary for public disclosure purposes in accordance with Public Resources Code Section 21003, 21061 and 21100.

Steven Adams
City Manager
City of King

8/25/16
Date

RESOLUTION NO. 2016-158

A RESOLUTION OF THE PLANNING COMMISSION OF THE CITY OF KING, COUNTY OF MONTEREY, STATE OF CALIFORNIA, RECOMMENDING THAT THE CITY COUNCIL APPROVE THE INITIAL STUDY AND NEGATIVE DECLARATION AND RECOMMENDING TO THE CITY COUNCIL THE APPROVAL OF TEXT AMENDMENTS AMENDING THE KING CITY MUNICIPAL CODE SECTION 17.03; THE M-1 AND M-2 ZONING ORDINANCES, SECTIONS 17.30.020 AND 17.31.020; AND, THE EAST RANCH BUSINESS PARK SPECIFIC PLAN ("ERBP-SP") AND RELATED PLANNING AND ZONING DOCUMENTS TO REGULATE MEDICAL MARIJUANA CULTIVATION

WHEREAS, in 1996, the voters of the State of California approved Proposition 215, which was codified as "The Compassionate Use Act of 1996," at California Health and Safety Code, section 11362.5 ("CUA") which had the stated intent to ensure that seriously ill individuals have the right to obtain and use marijuana for medical purposes when recommended by a physician. The Proposition further provides that "nothing in this section shall be construed to supersede legislation prohibiting persons from engaging in conduct that endangers others, or to condone the diversion of marijuana for non-medical purposes, and

WHEREAS, the ballot arguments supporting Proposition 215 expressly acknowledged that "Proposition 215 does not allow unlimited quantities of marijuana to be grown anywhere", and

WHEREAS, in 2004, the Legislature enacted Senate Bill 420 (codified as California Health & Safety Code § 11362.7 et seq. and referred to as the "Medical Marijuana Program" or "MMP" to clarify the scope of Proposition 215 and to provide qualifying patients and primary caregivers who collectively or cooperatively cultivate marijuana for medical purposes with a limited defense to certain specified State criminal statutes. Assembly Bill 2650 (2010) and Assembly Bill 1300 (2011) amended the MMP to expressly recognize the authority of counties and cities to "adopt local ordinances that regulate the location, operation, or establishment of a medical, and

WHEREAS, in the City of Riverside v. Inland Empire Patients Health and Wellness Center, Inc., 56 Cal.4th 729 (2013), the California Supreme Court upheld the right of local public agencies to regulate medical marijuana operations through their land use powers, and

WHEREAS, on November 26, 2013, the Third District Court of Appeal issued its opinion in Maral v. City of Live Oak 221 Cal.App.4th 975, which held cities have the authority to ban marijuana cultivation within their boundaries consistent with their local regulations; and

WHEREAS, on October 9, 2015, California Governor Brown approved the Medical Marijuana Regulation and Safety Act ("MMRSA"), which goes into effect on January 1, 2016, and establishes a comprehensive State licensing and regulatory framework for the cultivation, manufacture, transportation, storage, distribution, and sale of medical marijuana, also known as cannabis, through Assembly Bills 243 and 266 and Senate Bill 643, and

WHEREAS, MMRSA will become the governing regulation giving the State full control over the cultivation of marijuana in any city where local regulations were not adopted to regulate cultivation of medical cannabis and in effect on March 1st 2016; and

WHEREAS, the City intends to regulate and maintain local control over the dispensing, delivery and cultivation of medical cannabis in accordance with this ordinance; and

WHEREAS, mindful of the fact that marijuana possession and use is prohibited under federal law and partially decriminalized under state law, it is the City's intention that nothing in these ordinances shall be construed, in any way, to expand the rights of anyone to use or possess marijuana under state law; engage in any public nuisance; violate federal law, or engage in any activity in relation to the cultivation, distribution, or consumption of marijuana that is otherwise illegal. It is further the intent of the City of King to maintain local control over these matters to the fullest extent permitted by law.

WHEREAS, the Initial Study and Mitigated Negative Declaration prepared for the proposed Zoning Code amendments indicates that the amendments do not have the potential for creating significant adverse environmental impacts pursuant to the California Environmental Quality Act ("CEQA") Guidelines (14 California Code Regulations, § et seq.).; and

WHEREAS, on January 26, 2016, the City Council approved Ordinance 2016–718 , amending the City's Municipal Code to allow limited Medical Cannabis Cultivation uses within the M-1 and M-2 Districts and the East Ranch Business Park; and

WHEREAS, the City is considering adding to the allowed Medical Cannabis Related land uses; and,

WHEREAS, on September 06, 2016, the Planning Commission held a public hearing to receive oral and written testimony relative to the proposed amendments, Initial Study and Mitigated Negative Declaration; and

WHEREAS, the proposed attached ordinances amending: the Establishment, Operation and Regulation of Commercial Cannabis Businesses for Cultivation, Manufacturing and Testing of Medical Cannabis; the M-1 and M-2 zoning districts and the East Ranch Business Park Specific Plan and underlying zoning are consistent with the General Plan as described in the Draft Mitigated Negative Declaration.

NOW, THEREFORE, BE IT RESOLVED, after reviewing the Mitigated Negative Declaration and proposed zoning and specific plan amendments and considering all oral and written information regarding the Mitigated Negative Declaration and Zoning text amendments, including, but not limited to all related CEQA documents and the written and oral staff reports, that the Planning Commission does hereby recommend the City Council approve the Initial Study, Mitigated Negative Declaration ***(Attachment 4);*** amendment to Section 17.03, Medical Cannabis Activity, ***(Attachment 1);*** amendment to Sections 17.030.020 and 17.31.020, M-1 and M-2 Zoning, ***(Attachment 2;)*** and, the ERBP-SP amendment ***(Attachment 3)*** based upon the following:

Section 1. The Planning Commission **HEREBY FINDS AND DETERMINES** that the approval of the attached ordinances will not create potentially significant environmental impacts, and therefore recommends to the Council the adoption of a Mitigated Negative Declaration ***(Attachment 4)*** pursuant to the California Environmental Quality Act.

Section 2. The Planning Commission HEREBY APPROVES of Resolution No. 2016-158 recommending to the City Council the approval of the Ordinances attached as **Attachment 1-3** representing amendments to the City's Zoning Code and the ERBP-SP.

Section 3. The Planning Commission Chairman of the City of King is hereby authorized to affix his signature to this resolution signifying its adoption by the Planning Commission. The Community Development Director is directed to forward this Resolution to the City Council with the recommendations of the Planning Commission.

PASSED, APPROVED, AND ADOPTED by Planning Commission on this 19th day of January, 2016.

David Nuck

Dave Nuck

Chairperson

ATTEST:

Erica L. Sonne

Erica Sonne for

Maricruz Aguilar-Navarro

Planning Commission Secretary

I, Maricruz Aguilar-Navarro, Planning Secretary to the City Planning Commission, do hereby certify that Resolution No. 2016-158 was duly and regularly passed and adopted by the Planning Commission on the 06th day of September, 2016, by the following roll call vote as the same appears on file and of record in Office of the Community Development Department.

AYES: Nuck, Mendez, Barbree, Lee, Raschella

NOES:

ABSENT:

ABSTAIN:

Erica L. Sonne

Erica Sonne for:

Maricruz Aguilar-Navarro

Planning Commission Secretary

City of King

COMMENTS FROM PLANNING COMMISSION
SEPTEMBER 06, 2016
(From Staff Notes)

COMMISSION:

Commissioner Barbree asked about using natural gas heating for the building. Principal Planner Bruce stated that the discussion regarding natural gas was related to manufacturing technique and not the heating of the building.

Commissioner Lee wanted to know if the Police Chief has read this and has signed off on it. Principal Planner Bruce stated that he understood that the Chief had been part of the Ordinance development process.

PUBLIC:

Brandon Gesicki stated that he has had a conversation with the Chief and that he can do an unannounced visit at any time. They can use the video feed and look at it at any time. Staff indicated that they would verify with the Chief that he had read and approved of the Ordinance.

Josie Roberto, Herbalist, Santa Cruz. She is concerned about "why the City is banning alcohol extraction as it is the same equipment used for CO2 extraction and is not any less dangerous. Medicine is given better with alcohol, it is the supreme form of giving medicine". She would ask that the City reconsider. "Traditionally over time, alcohol has been used in a safe and effective way and is approved in California".

Josie spoke about Tinctures – a method of producing a cannabis extract by immersing powdered flower in alcohol. Note that a Tincture does not require high temperatures – approximately

CO2 INFORMATION AND COMNMENT
SEPTEMBER 13, 2016
(From Staff Research)

At the Public Hearing of August 23, 2016, Council requested that Staff provide additional information specifically related to use of CO2 in the Medical Cannabis environment, along with its potential hazards.

Staff has prepared the following information for your use. Staff will (efficiently) continue to research this item between this date (September 08, 2016) and the hearing of the 23rd to be able to provide additional information / clarity if needed.

From our research we have found that:

- The large majority of "Hash Oil" fires and / or explosions are related to the use of flammable gas such as butane or propane – with the vast majority of those being amateurs.
- CO2 is not a flammable gas. Tanks explode when exposed to fire. Heat will not be used in the proposed CO2 (Type 6) Manufacturing Process.

From our research we provide the following:

A. Wikipedia Summary Items (See H, below, for complete Wikipedia posting)
B. OSH Answers Facts Sheet : *Canadian Centre for Occupational Health and Safety*
C. MSDS for CARBON DIOXIDE (COMPRESSED): *ENERGAS (service provider of gases to various industry sectors)*
D. Amateur hash oil production – explosions bound to continue: *Seattle Times, originally published February 8, 2014 (see Highlights)*
E. Marijuana Extraction Guidelines for Commercial Licensed Facilities: *City of Denver Fire Department (see Highlights)*
F. Guidance for Mechanical Collection Systems for Cultivation Collectives : *City of San Jose Building Department*
G. Email from Cultivation Efficiency Systems
H. Complete Wikipedia Posting (Item A provides selections from this posting)

WIKIPEDIA SUMMARY: Selected ITEMS

Carbon dioxide - Wikipedia, the free encyclopedia.pdf - Adobe Reader

wood, carbohydrates and fossil fuels such as coal, peat, petroleum and natural gas.

It is a versatile industrial material, used, for example, as an inert gas in welding and fire extinguishers, as a pressurizing gas in air guns and oil recovery, as a chemical feedstock and in liquid form as a solvent in decaffeination of coffee and supercritical drying. It is added to drinking water and carbonated beverages including beer and sparkling wine to add effervescence. The frozen solid form of CO_2, known as "dry ice" is used as a refrigerant and as an abrasive in dry-ice blasting.

Carbon dioxide is a significant greenhouse gas. Since the Industrial Revolution, anthropogenic emissions - including the burning of carbon-based fossil fuels and land use changes (primarily deforestation) - have rapidly increased its

ChEBI	CHEBI:16526 (https://www.i.ac.uk/chebi/searchId.do?chId=16526)
ChEMBL	ChEMBL1231871 (https://www.ebi.ac.uk/chembldb/index.p/compound/inspect/ChEMBL231871)
ChemSpider	274 (http://www.chemspider.m/Chemical-Structure.274.hl)
EC Number	204-696-9
Gmelin Reference	989
Jmol 3D model	Interactive image (http://chem pps.stolaf.edu/jmol/jmol.php

https://en.wikipedia.org/wiki/Carbon_dioxide

Carbon dioxide - Wikipedia, the free encyclopedia.pdf - Adobe Reader

$$n\,CO_2 + n\,H_2O \rightarrow (CH_2O)_n + n\,O_2$$

Carbon dioxide comprises about 40-45% of the gas that emanates from decomposition in landfills (termed "landfill gas"). Most of the remaining 50-55% is methane.[25]

Uses

Carbon dioxide is used by the food industry, the oil industry, and the chemical industry.[22] The compound has varied commercial uses but one of its greatest use as a chemical is in the production of carbonated beverages: it provides the sparkle in carbonated beverages such as soda water.

Carbon dioxide bubbles in a soft drink.

Precursor to chemicals

In the chemical industry, carbon dioxide is mainly consumed as an ingredient in the production of urea, with a smaller fraction being used to produce methanol and a range of other products.[26] Metal carbonates and bicarbonates, as well as some carboxylic acids

methanol) is attractive as this could result in fuels that could be easily transported and used within conventional combustion technologies but have no net CO_2 emissions.[27]

Foods

Carbon dioxide is a food additive used as a propellant and acidity regulator in the food industry. It is approved for usage in the EU[28] (listed as E number E290), US[29] and Australia and New Zealand[30] (listed by its INS number 290).

A candy called Pop Rocks is pressurized with carbon dioxide gas at about 4×10^6 Pa (40 bar, 580 psi). When placed in the mouth, it dissolves (just like other hard candy) and releases the gas bubbles with an audible pop.

Leavening agents cause dough to rise by producing carbon dioxide. Baker's yeast produces carbon dioxide by fermentation of sugars within the dough, while chemical leaveners such as baking powder and baking soda release carbon dioxide when heated or if exposed to acids.

Beverages

carbon dioxide when heated or if exposed to acids.

Beverages

Carbon dioxide is used to produce carbonated soft drinks and soda water. Traditionally, the carbonation of beer and sparkling wine came about through natural fermentation, but many manufacturers carbonate these drinks with carbon dioxide recovered from the fermentation process. In the case of bottled and kegged beer, the most common method used is carbonation with recycled carbon dioxide. With the exception of British Real Ale, draught beer is usually transferred from kegs in a cold room or cellar to dispensing taps on the bar using pressurized carbon dioxide, sometimes mixed with nitrogen.

Wine making

Carbon dioxide in the form of dry ice is often used in the wine making process to cool down clusters of grapes quickly after picking to help prevent spontaneous fermentation by wild yeast. The main advantage of using dry ice

Carbon dioxide - Wikipedia, the free encyclopedia.pdf - Adobe Reader
File Edit View Window Help
Tools Sign Comment

Inert gas

It is one of the most commonly used compressed gases for pneumatic (pressurized gas) systems in portable pressure tools. Carbon dioxide is also used as an atmosphere for welding, although in the welding arc, it reacts to oxidize most metals. Use in the automotive industry is common despite significant evidence that welds made in carbon dioxide are more brittle than those made in more inert atmospheres, and that such weld joints deteriorate over time because of the formation of carbonic acid. It is used as a welding gas primarily because it is much less expensive than more inert gases such as argon or helium. When used for MIG welding, CO_2 use is sometimes referred to as MAG welding, for Metal Active Gas, as CO_2 can react at these high temperatures. It tends to produce a hotter puddle than truly inert atmospheres, improving the flow characteristics. Although, this may be due to atmospheric reactions occurring at the puddle site. This is usually the opposite of the desired effect when welding, as it tends to embrittle the site, but may not be a problem for general mild steel welding, where ultimate ductility is not a major concern.

It is used in many consumer products that require pressurized gas because it is inexpensive and nonflammable, and because it undergoes a phase transition from gas to liquid at room temperature at an attainable pressure of approximately 60 bar (870 psi, 59 atm), allowing far more carbon dioxide to fit in a given container than otherwise would. Life jackets often contain canisters of pressured carbon dioxide for quick inflation. Aluminium capsules of CO_2 are also sold as supplies of compressed gas for airguns, paintball markers, inflating bicycle tires, and for making carbonated water. Rapid vaporization of liquid carbon dioxide is used for blasting in coal mines. High concentrations of carbon dioxide can also be used to kill pests. Liquid carbon dioxide is used in supercritical

Carbon dioxide - Wikipedia, the free encyclopedia.pdf - Adobe Reader
File Edit View Window Help
Tools Sign Comment

Fire extinguisher

Carbon dioxide can be used to extinguish flames by flooding the environment around the flame with the gas. It does not itself react to extinguish the flame, but starves the flame of oxygen by displacing it. Some fire extinguishers, especially those designed for electrical fires, contain liquid carbon dioxide under pressure. Carbon dioxide extinguishers work well on small flammable liquid and electrical fires, but not on ordinary combustible fires, because although it excludes oxygen, it does not cool the burning substances significantly and when the carbon dioxide disperses they are free to catch fire upon exposure to atmospheric oxygen. Their desirability in electrical fire stems from the fact that, unlike water or other chemical based methods, Carbon dioxide will not cause short circuits, leading to even more damage to equipment. Because it is a gas, it is also easy to dispense large amounts of the gas automatically in IT infrastructure rooms, where the fire itself might be hard to reach with more immediate methods because it is behind rack doors and inside of cases. Carbon dioxide has also been widely used as an extinguishing agent in fixed fire protection systems for local application of specific hazards and total flooding of a protected space.[31] International Maritime Organization standards also recognize carbon dioxide systems for fire protection of ship holds and engine rooms. Carbon dioxide based fire protection systems have been linked to several deaths, because it can cause suffocation in sufficiently high concentrations. A review of CO_2 systems identified 51 incidents between 1975 and the date of the report, causing 72 deaths and 145 injuries.[32]

Supercritical CO_2 as solvent

Canada

Canadian Centre for Occupational Health and Safety (http://www.ccohs.ca/)

Home / OSH Answers / Chemical Profiles

OSH Answers Fact Sheets

Easy-to-read, question-and-answer fact sheets covering a wide range of workplace health and safety topics, from hazards to diseases to ergonomics to workplace promotion. MORE ABOUT (../../about.html) >

Carbon Dioxide

CLOSE ALL

▾ What are other names or identifying information for carbon dioxide?

CAS Registry No.: 124-38-9
Other Names: CO_2, Liquefied carbon dioxide, Refrigerated carbon dioxide
Main Uses: Manufacture of other chemicals, food processing, numerous other uses
Appearance: Colourless gas.
Odour: Odourless

Canadian TDG: UN1013, UN2187

▾ What is the WHMIS 1988 classification?

A - Compressed Gas

Class A

▾ What are the most important things to know about carbon dioxide in an emergency?

Emergency Overview: Colourless gas. Odourless. Will not burn. COMPRESSED GAS. Contains refrigerated gas. May explode if heated. CONFINED SPACE HAZARD. Can accumulate in hazardous amounts in low-lying areas especially inside confined spaces.

ASPHYXIANT. High concentrations can displace oxygen in air and cause suffocation. May cause frostbite.

What are the potential health effects of carbon dioxide?

Main Routes of Exposure: Inhalation

- **Inhalation:** Low concentrations are not harmful. Higher concentrations can affect respiratory function and cause excitation followed by depression of the central nervous system. A high concentration can displace oxygen in the air. If less oxygen is available to breathe, symptoms such as rapid breathing, rapid heart rate, clumsiness, emotional upsets and fatigue can result. As less oxygen becomes available, nausea and vomiting, collapse, convulsions, coma and death can occur. Symptoms occur more quickly with physical effort. Lack of oxygen can cause permanent damage to organs including the brain and heart.
- **Skin Contact:** Not irritating. Direct contact with the liquefied gas can chill or freeze the skin (frostbite). Symptoms of mild frostbite include numbness, prickling and itching. Symptoms of more severe frostbite include a burning sensation and stiffness. The skin may become waxy white or yellow. Blistering, tissue death and infection may develop in severe cases.
- **Eye Contact:** May cause mild irritation. Direct contact with the liquefied gas can freeze the eye. Permanent eye damage or blindness can result.
- **Ingestion:** Not a relevant route of exposure (gas).
- **Effects of Long-Term (Chronic) Exposure:** Not harmful.
- **Carcinogenicity:** Not known to cause cancer.

International Agency for Research on Cancer (IARC): Not specifically evaluated.
American Conference for Governmental Industrial Hygienists (ACGIH): Not specifically designated.

- **Teratogenicity / Embryotoxicity:** Not known to harm the unborn child.
- **Reproductive Toxicity:** Not known to be a reproductive hazard.
- **Mutagenicity:** Not known to be a mutagen.

What are first aid measures for carbon dioxide?

Inhalation: Take In case of oxygen deficiency: take precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing is difficult, trained personnel should administer emergency oxygen. If the heart has stopped, trained

personnel should start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED). Immediately call a Poison Centre or doctor. Treatment is urgently required. Transport to a hospital.

Skin Contact: Not applicable (gas). Liquefied gas: quickly remove victim from source of contamination. DO NOT attempt to rewarm the affected area on site. DO NOT rub area or apply direct heat. Gently remove clothing or jewelry that may restrict circulation. Carefully cut around clothing that sticks to the skin and remove the rest of the garment. Loosely cover the affected area with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Immediately call a Poison Centre or doctor. Treatment is urgently required. Transport to a hospital.

Eye Contact: Not applicable (gas). Liquefied gas: immediately and briefly flush with lukewarm, gently flowing water. DO NOT attempt to rewarm. Cover both eyes with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Immediately call a Poison Centre or doctor. Treatment is urgently required. Transport to a hospital.

Ingestion: Not applicable (gas).

First Aid Comments: Some of the first aid procedures recommended here require advanced first aid training. All first aid procedures should be periodically reviewed by a doctor familiar with the chemical and its conditions of use in the workplace.

▾ What are fire hazards and extinguishing media for carbon dioxide?

Flammable Properties: Does not burn.

Suitable Extinguishing Media: Not combustible. Use extinguishing agent suitable for surrounding fire.

Specific Hazards Arising from the Chemical: Can displace oxygen in the air, causing suffocation. Gas may accumulate in hazardous amounts in low-lying areas especially inside confined spaces, resulting in a health hazard. Closed containers may rupture violently when heated releasing contents. In a fire, the following hazardous materials may be generated: very toxic carbon monoxide, carbon dioxide.

▾ What are the stability and reactivity hazards of carbon dioxide?

- **Chemical Stability:** Normally stable.
- **Conditions to Avoid:** High temperatures. Temperatures above 52.0 °C (125.6 °F)

- **Incompatible Materials:** Increased risk of fire and explosion on contact with: metal powder or dusts. Not corrosive to metals.
- **Hazardous Decomposition Products:** None known.
- **Possibility of Hazardous Reactions:** None known.

▾ What are accidental release measures for carbon dioxide?

Personal Precautions: Increase ventilation to area or move leaking container to a well-ventilated and secure area. Vapour or gas may accumulate in hazardous amounts in low-lying areas especially inside confined spaces, if ventilation is not sufficient.

Methods for Containment and Clean-up: Stop or reduce leak if safe to do so. Ventilate the area to prevent the gas from accumulating, especially in confined spaces.

▾ What handling and storage practices should be used when working with carbon dioxide?

Handling: Prevent accidental contact with incompatible chemicals. Use the pressure regulator appropriate for cylinder pressure and contents. Secure cylinder in an up-right position. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. If used in a confined space, check for oxygen deficiency before worker entry and during work.

Storage: Store in an area that is: cool, dry, well-ventilated, out of direct sunlight and away from heat and ignition sources, temperature-controlled, secure and separate from work areas, on the ground floor or preferably, if storing in large volumes, in an isolated, detached building. Always secure (e.g. chain) cylinders in an upright position to a wall, rack or other solid structure.

▾ What is the American Conference of Governmental Industrial Hygienists (ACGIH®) recommended exposure limit for carbon dioxide?

ACGIH® TLV® - TWA: 5000 ppm

ACGIH® TLV® - STEL [C]: 30000 ppm

Exposure Guideline Comments: TLV® = Threshold Limit Value. TWA = Time-Weighted Average. STEL = Short-term Exposure Limit. C = Ceiling limit.

▾ What are the engineering controls for carbon dioxide?

Engineering Controls: Use local exhaust ventilation, if general ventilation is not adequate to control amount in the air.

▾ What Personal Protective Equipment (PPE) is needed when working with carbon dioxide?

Eye/Face Protection: Wear chemical safety goggles. (frost bite).

Skin Protection: Always wear insulated protective clothing, if contact with refrigerated gas is possible.

Respiratory Protection: Up to 40,000 ppm: if the oxygen content of the air is below acceptable limits, wear a NIOSH approved self-contained breathing apparatus (SCBA) or supplied air respirator.

Document last updated on October 14, 2015

What's New

Check out our What's New (../../whats_new.html) listing to see what has been added or revised.

Need more help?

Contact our Safety InfoLine (http://www.ccohs.ca/safetyinfoline.html)

(http://www.ccohs.ca/ccohs/contacting.html)

Tell us what you think

How can we make our services more useful for you? Contact us (http://www.ccohs.ca/ccohs/contacting.html) to let us know.

▾ Related Products and Services

You may also be interested in the following related products and services from CCOHS:

Courses

WHMIS 1988 for Workers (http://www.ccohs.ca/products/courses/whmiscourse/)
WHMIS 2015 for Workers (http://www.ccohs.ca/products/courses/whmis_workers/)

Databases

CHEMpendium™ (http://www.ccohs.ca/products/chempendium/)

OH&S Programs and Management Systems

MSDS Management Service (http://www.ccohs.ca/products/msds/msdsservice.html)

Software

CANWrite (http://www.ccohs.ca/products/canwrite/)

▶ Disclaimer

© Copyright 1997-2016 Canadian Centre for Occupational Health & Safety

Share this page

TOP OF PAGE

Date modified:
2016-09-07

MSDS FOR CARBON DIOXIDE (COMPRESSED)

Rev 5(11/2005)

1. Identification of the Substance/ Preparation and of the Company

Product Name: **Carbon Dioxide (Compressed)**

Chemical Formula: CO_2

Company Identification: Energas Limited
Westmorland Street
Hull HU2 0HX

Emergency Telephone No: 01482 329333

2. Composition/ Information on Ingredients

Substance/ Preparation: Substance
Components/ Impurities: Contains no other impurities which will influence the classification of the product.

CAS Number: 00124-38-9
EEC Number: 2046969 (from EINECS)

3. Hazardous Properties

Liquefied gas.
In high concentrations may cause asphyxiation.

4. First Aid Measures

Inhalation:
Low concentrations of carbon dioxide cause increased respiration and headaches.
In high concentrations may cause asphyxiation.
Symptoms may include loss of mobility/ consciousness.
Victim may not be aware of asphyxiation.
Remove victim to uncontaminated area wearing self-contained breathing apparatus.
Keep victim warm and rested. Call a doctor.
Apply artificial respiration if breathing has stopped.

Skin/ Eye Contact:
Flush eyes copiously with water for at least 15 minutes. Obtain medical assistance.

5. Fire Fighting Measures

Suitable Extinguishing Media:
All known extinguishants can be used.

Specific Hazards:
Exposure to fire may cause containers to rupture/ explode. Non-flammable.
Specific Methods:
If safe to do so, stop flow of product.
Move container away or cool with water from a protected position.

Hazard Combustion Products:
None.

Special Protective Equipment for Fire Fighters:
In confined spaces use self-contained breathing apparatus.

6. Accidental Release Measures

Personal Precautions
Evacuate area.
Ensure adequate air ventilation.
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

Environmental Precautions
Try to stop release.
Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

Clean Up Methods
Ventilate area.

7. Handling and Storage

Handling:
Refer to Energas Storage and Handling instructions.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature.
Open cylinder valve slowly to avoid pressure shock.
Do not allow backfeed into the container.
Suck back of water into the container must be prevented.
Contact Energas Limited if in doubt.

Storage:
Keep container below 50°C in a well-ventilated place.

8. Exposure Controls/ Personal Protection

Exposure Limit Value:
LTEL : 5000 ppm (8 hr TWA ref. period)
STEL : 15000 ppm (15 min. ref. period)

Personal Protection:
Ensure adequate ventilation.

9. Physical and Chemical Properties

Appearance/ Colour: Colourless gas.
Odour: Odourless

Melting Point:	-56°C
Boiling Point:	-75°C
Critical Temperature:	30°C
Relative Density (Liquid):	0.82 (liquid = 1)
Relative Density (Gas):	1.52 (air = 1)
Vapour Pressure @ 20°C:	57.3 bar
Solubility (water):	2000 mg/l

10. Stability and Reactivity

Stable under normal conditions.

11. Toxicological Information

Carbon Dioxide is classified as a non-flammable, non-toxic liquefied gas. It is normally present in atmospheric air at a level of approximately 350 parts per million (0.035%). It is a normal product of metabolism being held in bodily fluids and tissues where it forms part of the bodies normal chemical environment. In the body it acts in the linking of respiration, circulation and vascular response to the demands of metabolism both at rest and in exercise.

The effects of inhaling low concentrations of carbon dioxide are physiologically reversible but in high concentrations the effects are toxic and damaging.

NB The effects of carbon dioxide are entirely independent of the effects of oxygen deficiency.

The oxygen content in the atmosphere is therefore not an effective indication of the danger. It is possible to have acceptable low oxygen content of 18% and a high carbon dioxide content, of 14%, which is very dangerous.

Individual tolerances can vary widely, dependant on the physical conditions of the person and the temperature and humidity of the atmosphere, but as a general guide, the effects of inhaling varying concentrations of carbon dioxide are likely to be as follows: -

Concentration by Volume - Likely Effects

1 to 1.5%	Slight effect on chemical metabolism after exposures of several hours.
3%	The gas is weakly narcotic at this level, giving rise to deeper breathing, reduced hearing ability, coupled with headache, an increase in blood pressure and pulse rate.
4 - 5%	Stimulation of the respiratory centre occurs resulting in deeper and more rapid breathing. Signs of intoxication will become evident after 30 minutes exposure.
5 - 10%	Breathing becomes more laborious with headache and loss of judgement.
10 -100%	When the carbon dioxide concentration increases above 10%, unconsciousness will occur in under one minute and unless prompt action is taken, further exposure to high levels will eventually result in death.

The recommended exposure limit for carbon dioxide is 5000 parts per million (0.5%) by volume, calculated on an 8 hour time weighted average concentration in air.
Depending on regulations in individual countries carbon dioxide concentration peaks up to 30000 parts per million (3.0%) in air are allowed, where by the duration of exposure is between 10 minutes and 1 hour.
Cardiac or respiratory defects are likely to increase the hazards of inhalation.
Wherever any doubt exists, the recommended exposure limit of 5000 parts per million carbon dioxide in air should be regarded as the maximum level of the individual concerned.

12. Ecological Information

May contribute to the "Greenhouse Effect" when discharged in large quantities.
May cause pH changes in water.

13. Disposal Considerations

Vent to atmosphere in a well ventilated place.

Do not discharge into any place where its accumulation could be dangerous.
Contact Energas Limited if guidance is required.

14. Transport Information

UN No.	:	1013
Class/ Division	:	2.2
ADR/RID item	:	2A
Emergency Action Code	:	2T
Hazard Identification No.	:	20
CEFIC Tremcard No.	:	11-1/20g39
Labelling ADR	:	Label 2.2: Non-toxic, non-flammable gas.

Avoid transport on vehicles where the load space is not separated from the driver's compartment.

Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or emergency.

Ensure all cylinder valves are closed and not leaking and the load is firmly secured and complies with the applicable regulations.

15. Regulatory Information

EC Classification: Not classified as a dangerous substance.

- Symbols - road transport symbols are used and selected to the most stringent product classification.

  EC or ADR - Label 2.2: Non-toxic, non-flammable gas.

- **Risk Phrases**
  RAs Asphyxiant in high concentrations

- **Safety Phrases**
  S9 Keep container in a well ventilated place.
  S23 Do not breathe gas.

16. Other Information

Valve Connection: BS 341 No. 8

Ensure all users of this product understand the hazards of asphyxiation.

Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.

Details given in this document are believed correct at the time of going to press.

Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

Refer to Energas Limited General Safety and Handling Data Sheet for further details.

MSDS FOR CARBON DIOXIDE (COMPRESSED)

Rev 5(11/2005)

CYLINDER IDENTIFICATION TO BS EN 1089-3
GROUND COLOUR : DUSTY GREY (RAL 7037)

ENERGAS GENERAL SAFETY AND HANDLING DATA

1. GENERAL

Only trained persons should handle compressed gases.
Observe all regulations and local requirements regarding the storage of containers.
Do not remove or deface labels provided by the supplier for the identification of the container contents.
Ascertain the identity of the gas before using it.
Know and understand the properties and hazards associated with each gas before using it.
When doubt exists as to the correct handling procedure for a particular gas contact the supplier.

2 HANDLING AND USE

Wear stout gloves.
Never lift a container by the cap or guard unless the supplier states it is designed for that purpose.
Use a trolley or other suitable device or technique for transporting heavy containers, even for a short distance.
Where necessary wear suitable eye and face protection. The choice between safety glasses, chemical goggles, or full-face shield will depend on the pressure and nature of the gas being used.

Where necessary for toxic gases see that self-contained positive pressure breathing apparatus or full face air line respirator is available in the vicinity of the working area.
Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with a lower pressure rating than that of the container.
Ascertain that all electrical systems in the area are suitable for service with each gas.

Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 45°C.
Never re-compress a gas mixture without consulting the supplier. Never attempt to transfer gases from one container to another.
Do not use containers as rollers or supports, or for any other purpose than to contain the gas as supplied.
Never permit oil, grease or other readily combustible substances to come into contact with valves of containers containing oxygen or other oxidants.

Keep container valve outlets clean and free from contaminants, particularly oil and water.
Do not subject containers to abnormal mechanical shocks which may cause damage to their valves or safety devices.

Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier.
Close the container valve whenever gas is not required even if the container is still connected to the equipment.

3 STORAGE

Containers should be stored in a well-ventilated area. Some gases will require a purpose built area.
Store containers in a location free from fire risk and away from sources of heat and ignition. Designation as a no smoking area may be desirable.

Gas containers should be segregated in the storage area according to the various categories.

The storage area should be kept clear and access should be restricted to authorised persons only, the area should be clearly marked as a storage area and appropriate hazard warning signs displayed (Flammable Toxic etc,).
The amount of flammable or toxic gases should be kept to a minimum.
Flammable gases should be stored away from other combustible materials.

Containers held in storage should be periodically checked for general condition and leakage.
Containers in storage should be properly secured to prevent toppling or rolling .
Vertical storage is recommended where the container is designed for this.
Container valves should be tightly closed and where appropriate, valve outlets should be capped or plugged. Protect containers stored in the open against rusting and extremes of weather.
Containers should not be stored in conditions likely to encourage corrosion.
Store full and empty containers separately and arrange full containers so that the oldest stock is used first.

PRODUCTION SITE ADDRESSES

Engineering and Welding Limited
Westmorland Street
Hull
HU2 0HX

Tel: 01482 329333
Fax: 01482 212335

Energas Limited
Haslams Lane
Alfreton Road
Derby, DE22 1EB

Tel: 01332 364121
Fax: 01332 291590

Energas Limited
Brownroyd Street
Off Thornton Road, Bradford
West Yorkshire, BD8 9AF

Tel: 01274 549090
Fax: 01274 548181

FOR FURTHER INFORMATION CONTACT YOUR NEAREST DISTRIBUTION CENTRE

Amateur hash-oil production, explosions bound to continue

From Spokane to Seattle, Vancouver to Mount Vernon, amateur chemists have caused explosions in recent months, often in homes, while using flammable solvents to produce hash oil.

The most recent blast occurred Monday in a Spokane Valley kitchen. Three weeks earlier, an explosion in a Vancouver home left a man hospitalized with burns to his face.

Last month, hash-related explosions caused $100,000 in damage to a Kirkland apartment and lifted a South Seattle house off its foundation.

The most devastating local explosion may be a November blast in Bellevue that did more than $1 million in damage to the Hampton Greens apartment building. In escaping the fire, former Bellevue Mayor Nan Campbell, 87, fell and suffered injuries that contributed to her death in the hospital two weeks later.

Bellevue police said they are investigating the fire and have declined to release a cause. A source close to the case said investigators found all the supplies to manufacture a marijuana-related oil — possibly hash oil — inside one of the burned apartments.

This phenomenon is not part of the state's legal marijuana system. Under rules for the state's new industry, hash oil can only be made in licensed facilities, and those do not include homes.

State rules also require that only certain equipment and chemicals be used, for safety reasons. No facilities have yet been licensed by the state, which is sifting through 7,000 applications for marijuana businesses.

Still, amateur hash-oil production and resulting explosions likely will continue, as the Internet is rife with tutorials and the popularity of the super-potent hash oil is increasing with young stoners.

In its Weed Issue last year, Rolling Stone called hash oil "America's insanely baked future." Mark Kleiman, author of "Marijuana Legalization," has predicted that concentrated extracts will eventually eclipse traditional marijuana in the state's new recreational-pot industry.

Explosions are not limited to Washington state. A search of news reports last year turns up stories of hash-oil explosions from Florida to Hawaii, with a rash along the West Coast.

The Oregonian reported a Jan. 10 blast in Forest Grove that left a man in critical condition. In the past 14 months, at least 17 people have landed in Southern California burn centers due to hash-oil accidents, according to the Los Angeles Times.

Another 27 victims were treated by a burn unit in Northern California, the paper reported, noting that the hash-oil toll was far worse than injuries attributed to meth-lab explosions in the same period.

The Federal Emergency Management Agency (FEMA) sent out an alert last year noting that many explosions were misidentified as meth-lab mishaps.

Concentrated forms

People have consumed concentrated forms of marijuana for several thousand years. The most common form has been hashish, generally made by removing the most psychoactive resin from pot plants and compressing it into slab form.

Several years ago hash oil — in forms called honey oil, budder, shatter and wax — exploded in popularity.

Hash oil can be superstrong. Marijuana in Seattle medical dispensaries tends to contain 12 to 20 percent THC, pot's key psychoactive chemical. Modern hash oil tends to have 40 to 70 percent THC.

"We've seen purities as high as 73 percent," said Jodie Underwood, spokeswoman for the federal Drug Enforcement Administration (DEA).

The drug's use has soared with the rise of vaporizing devices, such as "vape pens," sleek cylindrical gizmos that look like e-cigarettes. Vaporizers are used to consume "dabs" of hash oil in a way that lacks the telltale odor of burned marijuana flowers and is more discreet than sparking a joint or blazing a pipe bowl.

Amateur chemists have taken to making hash oil at home. The most popular method — called "blasting" — involves flammable solvents, particularly butane, which can be bought in hardware stores.

Usually, a glass or steel canister is stuffed with dried pot. The canister is then flooded with the solvent, which strips away the psychotropic plant oils. The resulting golden-brown goo is then purged of the solvent, often by boiling it in water.

The danger comes in improper ventilation. Odorless and colorless, butane is heavier than air and puddles in a closed room; sparks can cause catastrophes.

That's what happened in the Kirkland blast last month, according to a Police Department spokesman.

Sometimes explosions occur despite precautions. The Los Angeles Times reported that one injured oil-maker made sure a window was open, a fan was blowing and the stove's pilot light was off. He told the paper he believed a static spark from his shirt ignited the butane that left him with serious burns over most of his body and required 16 skin grafts.

Another mistake was highlighted by the South Seattle blast last month. Fire investigators said butane was left in a freezer, apparently leaked into a refrigerator below and into its electrical system. When the refrigerator kicked on, it ignited an explosion.

Washington state is requiring that extractors use closed-loop systems that keep flammable gases from escaping. There also are alternatives to butane. Carbon-dioxide extraction is considered the cleanest, safest way to make hash oil. But equipment can be expensive.

Brandon Hamilton, owner of WAMOIL in Seattle, produces concentrates sold in about 50 medical-marijuana dispensaries in the state. His carbon-dioxide extractor cost $65,000, he said. He said he employs a professional chemist and has given tours to the Seattle police and fire departments, to help them understand how hash oil should be made.

As for the amateurs, Hamilton said risks are pervasive no matter what precautions they take because butane can slip undetected into electrical outlets and wiring.

"They're walking on a cliff with no safety net whatsoever. It only takes one little thing to get you off kilter and you'll cause an explosion," he said.

Calibrated doses

It's tempting to call hash oil the "Breaking Bad" of pot, referring to the television series about methamphetamine manufacturers.

But not all marijuana concentrates are the same, not all are consumed by "dabbing," and concentrates, including some that have virtually no psychoactive chemicals, can be especially helpful to medical-marijuana patients.

CNN's Dr. Sanjay Gupta hosted a special last year that showed how marijuana concentrates alleviated the frequent epileptic seizures of a girl in Colorado. Locally, Thurston County resident Ryan Day has testified to state legislators about the way concentrates relieve his 5-year-old son's seizures.

One advantage of concentrates is they allow patients to consume calibrated doses orally, so they don't have to smoke or vaporize.

Hash-oil production has been allowed under the state's vague medical-marijuana laws. The state's new recreational-pot law does not explicitly bar making hash oil at home for personal consumption, as long as it does not involve more than one ounce of dried marijuana.

The DEA's Underwood said she expects to see a continued increase in hash-oil explosions with the current climate of marijuana. All forms of pot remain illegal under federal law, she noted.

But the U.S. Department of Justice has said the states of Colorado and Washington can proceed with legal marijuana as long as they adhere to eight priorities, such as keeping legal pot from minors, and keeping it from being diverted to other states.

If the DEA finds a hash-oil case violated one of those priorities, Underwood said agents might investigate.

Hamilton, the professional extractor, agreed that accidents will likely continue because amateurs can buy "blasting" supplies for $100 or less. And, even in a legal recreational market, minors won't be allowed to buy pot.

"Kids are going to do it while their parents are not at home," he said. "That's the primary thing that will happen after Initiative 502 stores open, I believe."

Seattle Times staff reporter Jennifer Sullivan and news researcher Gene Balk contributed to this report.

Denver Fire Department
Fire Prevention Division

745 West Colfax Avenue
Denver, CO 80204
p: 720.913.3474
f: 720.913.3596
www.denvergov.org/fire

FIRE DEPARTMENT
DENVER PUBLIC SAFETY

MARIJUANA EXTRACTION GUIDELINE FOR COMMERCIAL / LICENSED FACILITIES

The information contained within this guideline is provided solely for the convenience of the reader to help clarify how the Denver Fire Code (DFC) applies to marijuana extraction processes and equipment at commercial facilities licensed by the Denver Department of Excise and Licenses. Because every process and building differs, this guideline is not intended to identify or discuss every code requirement applicable and it is not intended to be a regulatory document; therefore, it is the responsibility of the persons performing these processes and/or otherwise responsible for the design or construction of extraction rooms, equipment, and operations to follow all applicable Codes and Standards as adopted by the City and County of Denver. This guideline is based upon the 2016 Denver Fire Code.

Part I – Extraction Process Equipment

Extraction equipment, including equipment used for winterization or other oil refining processes, that use hazardous materials (i.e. flammable / combustible liquids, Carbon Dioxide (CO_2), liquefied petroleum gases (i.e. butane), etc) are required to be listed or approved per DFC Section 2703.2.3.

I.A Liquefied Petroleum Gas (LPG) and CO2 Extraction Equipment

Only closed-loop type LPG extraction equipment is permitted. Open blasting extractions or equipment that releases butane to the atmosphere during the extraction process is strictly prohibited.

Because there is no listing (such as UL, ETL, etc) available for compressed-gas extraction systems using hazardous materials, extraction equipment approval is required from the Denver Fire Department for use in the City and County of Denver. To obtain equipment approval, an engineering report (signed and sealed by a licensed Colorado engineer) must be submitted for approval. This approval report is required by DFC Section 104.7.2. It is the responsibility of the engineer to justify how the system meets the Denver Fire Code and any other national standards as a basis of design, including an analysis / description of every component of the system. Thus far, approved LPG (i.e. butane or propane) only closed-loop systems have been designed to applicable sections of NFPA 58. Open-blast LPG extractions are prohibited. In addition to the engineering report, an owners operation manual must be submitted with specific instructions regarding proper use of the equipment and any safety provisions identified. Equipment may be submitted / approved either by a Master Engineering Report or a Site Specific Engineering report. Engineering reports can be submitted in hard copy, signed and sealed by the licensed design professional, at 745 W Colfax, attention Brian Lukus.

In addition to this engineering report approval process, if the extraction equipment uses electrical components, a National Recognized Testing Laboratory (NRTL) listing is also required in addition to the engineering report certifying that the electrical components are compliant with appropriate electrical standards.

Site Specific Engineering Report: Site specific engineering reports can be submitted which approve extraction equipment exclusively to a location and specific equipment. A Plant Extraction Systems Operational Permit will be issued for final approval of the extraction equipment and use. Any modification of the equipment or relocation of equipment to a new address voids the equipment approval.

Master Engineering Report – For manufacturers of extraction equipment, a Master Engineering Report can be submittal for approval in lieu of submitting Site Specific reports for every address. Once approved, the report is retained by the Denver Fire Department. Site specific approval letters are then provided by the report Engineer of Record certifying (by location address and serial number) that the equipment on-site meets the approved Master Engineering Report on file. Once this letter is received (and all other extraction room safety provisions are met), a Plant Extraction Systems Operational Permit will be issued for final approval of the extraction equipment and use. Any modification of the equipment or moving addresses voids the equipment approval. See *Extractor Approval List* document on the Denver Fire Department website for a list of manufacturers with approved Master Engineering reports.

I.B Flammable liquid distillation or evaporative process equipment

There are numerous methods to perform distillation or evaporative extraction / refinement processes. In general, electrified equipment used in these processes are required to be listed by a NRTL for their intended use and are required to be operated within the manufacturer's guidelines. Equipment such as rotary evaporators are typically listed for distillation processes. Where distillation stills or heated evaporation processes are performed, the heating source shall be listed as explosion-proof (i.e. rated for the electrically classified location) unless it can be shown that the equipment has been tested during its listing to heat flammable liquids without the explosion-proof classification. Approval of the proposed process equipment must be submitted during construction permitting review.

I.C Vacuum Ovens

Vacuum ovens shall not be used to process volatile gases (i.e. alcohol/oil mixtures, oil containing off-gassing LPG, other flammable liquids, etc) unless the vacuum oven is rated to process these vapors (typically an explosion-proof classification). It is the responsibility of the extraction process operator to ensure the material being introduced into the oven does not contain volatiles. All vacuum ovens shall be listed by a NRTL.

I.D Refrigerators

Refrigerated storage or processing of flammable liquids including oil-laden with flammable liquids must only use refrigerators/freezers rated to store flammable liquids. At minimum, a "Lab-Safe" or "Flammable Safe" rated refrigerator/freezer must be used. Residential type refrigerators are not rated by the manufacturer for flammable liquid storage or processing. See NFPA 45 for further information regarding refrigerators used for flammable liquid storage.

Part II – Extraction Room Construction, Gas Detection, Exhaust, & Electrical Systems

II.A Room Construction

Extraction rooms are required to be located in a room dedicated to the extraction process. There must be no other equipment within the room (i.e. refrigerators, cooking appliances, electrical panels, computers, cell phones, etc) that is not associated with the extraction process. Additionally there must be no penetrations into the room that are not essential for the extraction process (i.e. gas lines, HVAC systems, plumbing, etc.)

Rooms are to be of continuous, noncombustible, and smooth construction, and room finish should also consider Department of Health requirements for cleaning purposes. Booths constructed in compliance with flammable finish requirements of DFC Section 24 will be accepted as meeting these construction requirements. Acoustic-type drop ceilings that could conflict with large LPG extraction exhaust systems will not be permitted. Hand sinks and eye wash stations (if required by other Codes) can be located in the room.

Doors to the extraction room using hazardous materials (i.e. CO2, LPG, or flammable liquids) must swing in the direction of egress, be self-closing/latching, and be provided with panic hardware.

Post oil processing typically uses small volumes of flammable liquids and may be performed outside of a dedicated extraction room. This process can typically be performed under a bench-top chemical fume hood.

II.B Suppression Systems

An LPG extraction room, booth, or hood is required to be provided with an automatic fire suppression system in accordance with DFC Chapter 9. A suppression system is also required in a flammable liquid extraction room, booth, or hood where vapors are released exceeding 25% of the LFL (lower flammable limit). No suppression systems are required in CO2 extraction rooms. Where the building is required to be sprinklered, the sprinkler system shall be extended to the room, booth, or hood. Where the building is not required to be sprinklered, an alternative suppression system must be provided in accordance with DFC Section 904.

These extraction room requirements are not applicable to water extractions, kief production rooms, food-based extractions, or other extraction processes not using hazardous materials.

II.C LPG Extraction Process Gas Detection Systems

There are two forms of flammable gas detection required in LPG extraction areas: fixed continuous flammable gas detector serving the room, hood, or booth and a portable flammable gas detector. The intent of these types of flammable gas detection systems within LPG extraction areas is twofold: for alerting the extraction process operator(s) that the area is at or above 10% of the lower flammable limit and for the extraction process operator(s) to specifically identify potential leaks during the extraction and additionally to determine when

oil and spent plant material is finished off-gassing and is safe to be removed from the extraction area.

The fixed detector must be installed in accordance with the manufacturers' guidelines and depending on the size and configuration of the room, booth, or hood, additional detectors may be required. The fixed detection alarm is a local alarm only and does not require off-site monitoring and does not require full occupant notification of the building or extraction room (including ADA visual notification) as a fire alarm system may require. Fixed detection is to alarm at 10% of the lower flammable limit. The method of alerting the extraction operator (audible / visual notification) is based on the type of the gas detector chosen. Some detectors have integrated visual alarms only that can be accepted when installed within clear view of the extraction operator; i.e. at eye level with the sensor extended to the floor. Otherwise, a remote visual or audible local alarm can be accepted.

II.D LPG Extraction Exhaust Systems

A hazardous exhaust system is required to be installed in accordance with the Mechanical Code for extraction processes using LPG. There are many different ways to design a hazardous exhaust system including fume hoods, walk-in hoods, booths, and exhausted rooms. There are manufacturers of booths and hoods that meet this requirement in a complete off-the-shelf package. Exhaust systems can also be built specifically to suit the needs of a location or process; however, no one system is dictated by the Fire Code. The engineer of record must design and/or specify a system to meet the minimum requirements of a hazardous exhaust system.

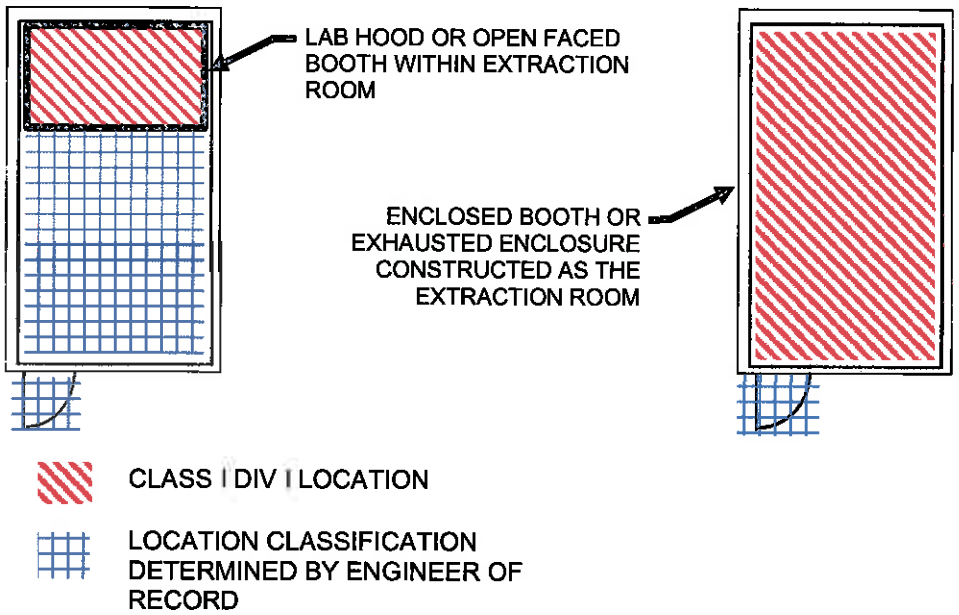
The intent of the exhaust system provided is to be designed with capture and containment velocities across the work area (IMC 510.5.4) as typically seen with other industrial or laboratory processes using hazardous materials. There are several work areas that must be considered in this design and may be different for each extraction equipment manufacturer. The extraction process equipment location, the location of oil retrieval, and the location of LPG-laden plant material removed from the extraction equipment for degassing are all work areas that are intended to be provided with exhaust system capture and containment velocities. The assumption that a "closed-loop" system does not release LPG into the atmosphere will not be accepted as a basis in the design of these exhaust systems, since all extraction systems must be opened at some point in the process with vapor released. It is recommended that the ACGIH Industrial Ventilation Handbook be consulted for exhaust system and capture and containment velocity design.

II.E LPG Extraction Electrical Systems

The location of the LPG extraction process must be considered a Class I Division I location in accordance with the National Electric Code (NEC); depending on the type of exhaust system provided, this could be the entire room or the area inside of a hood or booth. This Class I Division I requirement was based on flammable gas metering of several extraction processes, all of which exceeded minimum LFLs during equipment opening for oil retrieval and removal of LPG-laden plant material in addition to other known equipment and accidental process failures releasing LPG. Flammable gasses are present during normal extraction operations, therefore this location meets the definition of a Class I Division I location per the NEC.

The location adjacent to the Class I Division I location must be classified by the design engineer (i.e. doors to the extraction room, hoods opening into the extraction room, etc.). This is dependent on the type of exhaust system provided and the room configuration. Normally, adjacent locations are Class I Division II; however, the NEC does not define a required distance that an "adjacent location" must be from the Class I Division I location in order to be classified as a Class I Division II location. The NEC defines Class I Division II as a location where flammable vapors could be present from accidental rupture or breakdown of containers. Therefore, this location classification should be established on a total extraction equipment failure. This classification has been intentionally left to the determination of the responsible engineer since many factors can influence this area, such as mechanical exhaust sizing, total LPG within the extraction equipment, etc.

Typical LPG exhaust types and the associated NEC location classification is illustrated below.



Based on the Class I Division I location, all equipment in the extraction room must be rated for use in Class I Division I locations. This includes lighting, power receptacles, vacuum pumps, recovery pumps, and any other electrical equipment in the room. The need for explosion-proof rated equipment can be minimized. Lighting located behind a vapor-tight glazing panel outside of the extraction room/booth is not required to be classified as Class I Division I; this concept is similar to flammable finish spray booth lighting systems. Other extraction process support systems such as air compressors to drive recovery pumps, heated / chilled water circulation pumps, vacuum air systems, etc can all be located outside of the Class I location and piped into the process area. Where electrical equipment is needed, it must be rated for the Class I location in which it is installed in.

To reduce the possibility of spark from static discharge, all metal objects including ductwork, hand sinks, water piping, etc. must be grounded / bonded in accordance with the NEC. This will also require the extraction equipment to be grounded/bonded.

The room lighting and room power receptacles (where provided) are required to be interlocked with the exhaust system such that the room power and lighting will not operate without the exhaust system running. Power serving room flammable gas detectors is not required to be part of this interlock requirement.

II.F Flammable Liquid Extraction & Post Oil Processing Gas Detection Systems

None Required.

II.G Flammable Liquid Extraction & Post Oil Processing Exhaust Systems

For the purposes of this section, exhaust system requirements for extraction processes using flammable liquids are also required for post oil processing using flammable liquids. Post oil processing is an oil refining or winterization process occurring after the initial extraction is completed.

There are many different methods available to perform flammable liquid extractions as well as a variety of equipment available; therefore, all processes cannot be described in detail within this guideline. Generally, these processes can be grouped into two categories; distillation extractions where most of the flammable solvent is recollected OR a heated boil-off (evaporative) process where flammable liquid is evaporated to the atmosphere without recollection.

A hazardous exhaust system is required complying with IMC Section 510 for flammable liquid processes exceeding 5 gallons. These typically include boil/evaporative processes, distillation processes, and flammable liquid plant wash processes. This exhaust system is intended for larger processes where dispensing of flammable liquids also occurs in greater volumes, flammable liquid laden plant material is removed from equipment and/or vapors are present from heated extraction processes. The exhaust system must provide capture and containment velocity across the work area per IMC Section 510.5.4 and is typically provided in the form of a standard lab-type exhaust hood. It is suggested that the ACGIH Industrial Ventilation Handbook be consulted for exhaust system and capture velocity design.

Distillation process using less than 5 gallons are to be performed under a chemical fume hood designed to contain fumes within the hood and exhaust them to the exterior. This system does not have the duct gauge thickness and other requirements of a full hazardous exhaust system. This exhaust system is typically for smaller bench-top type of distillations and also small flammable liquid dispensing volumes.

Listed solvent distillation units complying with DFC 5705.4 are not subject to these exhaust system requirements.

II.H Flammable Liquid Extraction & Post Oil Processing Electrical Systems:

For rooms, booths, or hoods containing flammable liquid extraction or post oil processes, the electrical location classification must be specified by the responsible licensed design professional. It is expected that this classification is included on building permit drawings and

that supporting information is submitted justifying how the location classification was determined. Because there are numerous methods of performing flammable liquid extractions, the process must be evaluated and the classification determination must be established by the licensed design professional. Note that the licensed design professional must consider not only the process equipment, but also the dispensing (i.e. filling and removal) of flammable liquids, soaking (i.e. plant wash) material in open containers, and the removal of plant material saturated with flammable liquids, because these operations may have an impact on the location classification.

Also see section I.B of this guideline for further information.

II.I CO2 Extraction Process Gas Detection Systems

A fixed continuous CO2 detection system is required within CO2 extraction rooms set to alarm at 5000 ppm. This system is a local alarm only and is not required to be monitored off site. The system is intended to alert the extraction operator of a potential asphyxiation hazard. There is no requirement to alarm the building nor to have ADA compliant visual notification as typically required for fire alarm systems.

II.J CO2 Extraction Exhaust Systems & Electrical Systems

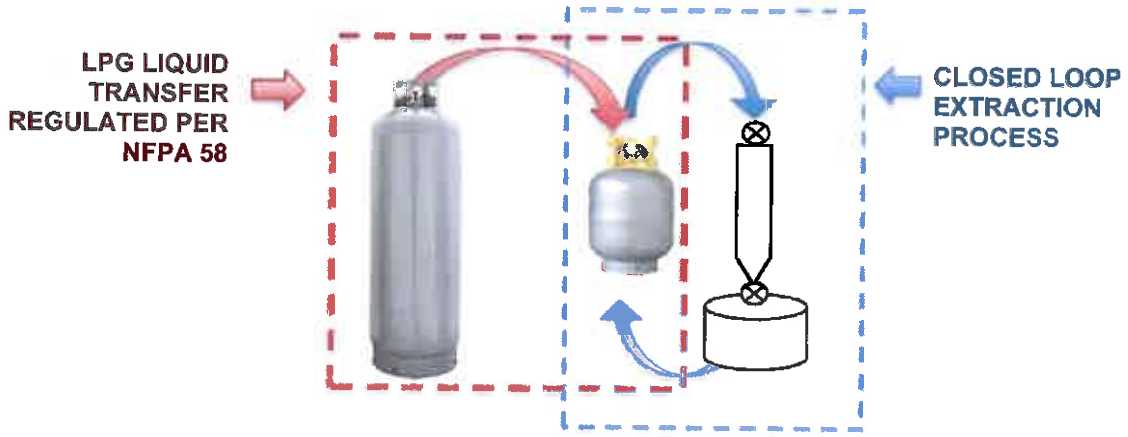
CO2 extraction equipment is required to have releases of CO2 piped to the exterior. Stored cylinders shall be secured to a fixed object to prevent falling. See DFC Chapter 53 for compressed gas storage requirements.

There are no further exhaust system or electrical requirements above ordinary requirements of the Denver Building Code.

Part III – Filling LPG Extraction Equipment

III. A Filling LPG Extraction Equipment

Although manufacturers may use different terminology, extraction equipment includes an LPG solvent tank (i.e. a local system supply tank) which is filled with LPG and supplies the extraction equipment and this same tank is also used to reclaim LPG after the extraction. The approval for closed loop LPG extraction equipment discussed in Part I of this document approves only the closed loop system. Filling the LPG solvent tank from a bulk tank (i.e. typically a 100# tank) is not included in the extraction equipment approval and is regulated per NFPA 58 as LPG liquid transfer. This delineation is depicted below.



Filling the solvent tank is regulated as LPG liquid transfer under NFPA 58 and must be conducted outdoors. Indoor filling and/or indoor filling from piped LPG liquid systems may be conducted indoors where the room and process has been designed in accordance with NFPA 58, notably Chapter 10; the requirements of this chapter are stringent and will not be discussed herein due to their complexity. Where performed, this process is included in the Plant Extraction Systems operational permit issued; information on LPG liquid transfer must be included at this time of permit application.

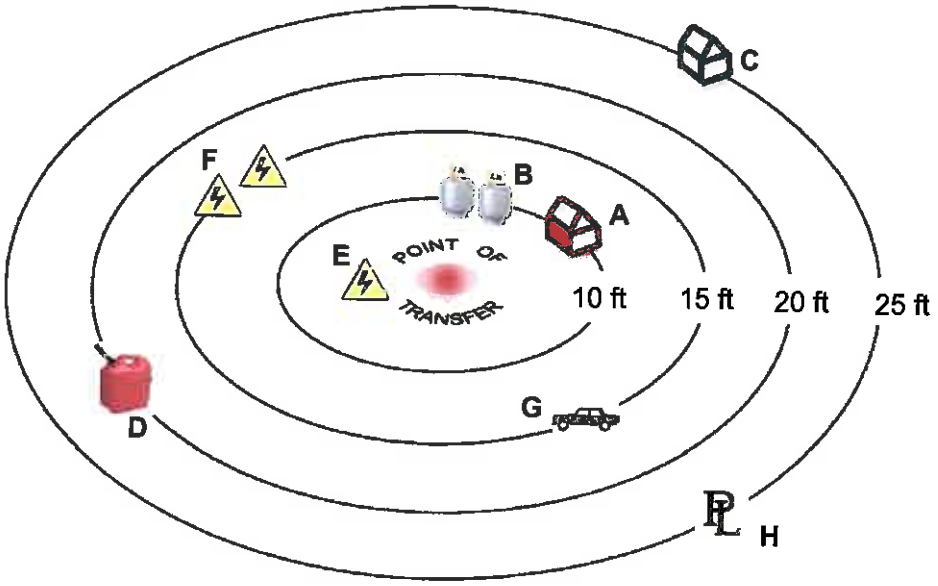
LPG liquid transfers using lighter refill-type containers using can taps or other puncture equipment is prohibited.

The following is a summary of requirements from NFPA 58:

i. Personnel conducting liquid transfer operation shall be trained in LPG filling (recertified every 3 year). Documentation of training shall be available (NFPA 58-7.2.1)
ii. Public access to the filling location must be restricted (i.e. fenced area)
iii. The filling location must be located 15' from combustion engine use; i.e. vehicle parking. All ignition sources shall be shut off. The location may be located against a noncombustible building wall without openings

iv. Electrical equipment is required to be Class I Division I within 5' and Class I Division II within 15' of filling operations.
v. Where heating blankets are used, they must be listed for use in explosive environments. An electrical permit is required for any circuits being extended to the filling location.
vi. Where scales are used for weighing containers, they shall be Class I Division I listed or be of the mechanical type.
vii. Smoking, portable lighting, portable electric tools, etc shall not be in use within 25' of the filling operation.
viii. Purging of tanks may be performed at the tank filling location in accordance with NFPA 58. The tank must be rapidly dispersed in the atmosphere, where environmental conditions do not allow rapid dispersal (i.e. wind conditions, site conditions such as neighboring buildings on lot lines not allowing adequate natural ventilation, etc). LPG must be flared using a method in compliance with NFPA 58.

The NFPA 58 separation distances from the transfilling location are illustrated below.



A. Buildings with 1HR fire rated exterior wall
B. LPG Containers in Storage
C. Buildings with non-fire rated exterior wall or building openings
D. Flammable / combustible liquid storage
E. Class I Division I electrically classified area within 5' of transfer
F. Class I Division II electrically classified area
G. Vehicle traffic
H. Property Line that can be built upon

[END OF DOCUMENT]

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Department of Planning, Building and Code Enforcement

Building Division

Guidelines for Mechanical Systems for Cultivation Collectives constructed in accordance with City of San Jose Ordinance No. 29421 and California Code of Regulations, Title 24.

Technical Requirements:
(During working hours or anytime people present)

Office area and non odorous areas where product is in sealed containers will be reviewed as an ordinary commercial building. Designs that include a kitchen shall be reviewed by the Health Department and Environmental Services Department Source Control.

All other areas that are exposed to product odor or where there is a potential for product exposure shall meet the following:

1. Minimum outside air provided to any room, including growing/cultivation rooms shall meet Title 24 ventilation requirement or 2013 CMC Table 402.1 for pharmacy prep area. In growing/cultivation rooms, provide minimum of .15 cfm /ft^2
2. Air intake/make up air shall have proper filtration.
3. All air exhaust shall go through listed specifically impregnated carbon filter for agricultural odor removal.
4. Corridors and hallways or any room considered non odorous may not be used as part of odorous room ventilation design unless it is determined by AHJ that air may not migrate or diffuse from odorous area to non odorous area.
5. If roof top units are used to provide both air conditioning and outside air, the discharge side of the RTU shall be equipped with the listed carbon filter impregnated specifically for agricultural odor removal.

In facilities with CO2 use:
(In addition to the requirements listed above)

6. In addition to the CO2 detection and monitoring and control performed by electronic means, redundant engineered CO2 flow control shall be required.
   Note: CO2 generators that use natural gas and discharge product of combustion into the cultivation area, are not permitted.
7. Redundant engineered flow control such as restrictive flow orifice (RFO), will be based on OSHA's requirement. The concentration of CO2 in areas where CO2 is intentionally injected shall never exceed 5000 ppm, (https://www.osha.gov/dts/chemicalsampling/data/CH_225400.html).
8. CO2 storage, delivery and dispensing system shall be designed, stamped and signed by experienced California registered mechanical engineer.
9. CO2 storage, delivery and dispensing system shall be designed such that regardless of the CO2 monitoring system, physically will be impossible to release CO2 beyond the 5000 ppm concentration anywhere around CO2 storage, delivery and dispensing systems.
10. CO2 dewer shall have an RFO. The main delivery line from the dewer(s) shall be ¼" in size. Any branch line of CO2 going into a room/chamber shall have an additional RFO.
    http://www.mathesongas.com/pdfs/products/Restrictive-Flow-Orifices.pdf
11. RFO's shall be sized to limit the flow of CO2 that disperses into a total of 5000 ppm of CO2.
    http://prod.sandia.gov/techlib/access-control.cgi/2003/031874.pdf
12. CO2 monitoring shall be done on two levels
    a. First level/warning- As part of the sequence of operation CO2 is dispersed to normal level of 1200 ppm (set be owner). A local alarm and yellow light will indicate that an undesirable level of 2000 ppm (set by owner) has been reached.
    b. Second level/danger- This level is set at 5000 ppm. This is the condition of permit to operate. A local alarm will sound and a red light will turn on and an emergency exhaust system will be activated.
13. Provide a sequence of operation for the delivery and monitoring of CO2 under normal, alarm and emergency conditions.

EMAIL FROM CES

On Sep 7, 2016, at 7:45 PM, Mat Johnson <mjohnson@cultivationefficiency.com> wrote:

Ref: 151 Airport Road, King City, CA 93930

Dear Scott Bruce,

I represent Josh Rizz of UA Technologies/Boutique Unlimited's design and mechanical HVAC supplier. I've been asked to share with you examples of other city requirements for CO2 dispensing and storage. Typically we've found there to be two options for the level of CO2 required.

Option 1
Airgas will supply a standard outside tank that is available in a number of different sizes. UA Technologies/Boutique Unlimited will require up to 9,000 lbs (78,669 scf) possibly refilled every 2-weeks.

Option 2
NuCO2 can supply (12) 750 lb tanks stored securely with safety protocols in the warehouse. These are commonly provided to beverage companies or restaurants and are now being accessed by industrial cannabis facilities. Safety protocols include cinder blocks to prevent accidental car collisions with pressurized tanks, CO2 metering with alarms (both audio and visual) for potential leaks, and built-in RFO's (restrictive flow orifices) in the piping to reduce the exposure of excessive CO2 leaks from an accidental puncture.

Attached are guidelines for CO2 requirements provided by the city of San Jose for industrial cannabis facilities. Below, I've listed specifically the requirements of CO2 safety protocols that are in question.

<Capture.JPG>
I have found that this example of safety protocols required by the city of San Jose meets or exceeds other city/state code requirements as well as code requirements issued by Health Canada. Please let us know if there are any deviations to King City's code requirements so I can implement them into our client's design. If you have any additional questions regarding general code requirements issued to other facilities we've designed, please feel free to reach out.

Sincerely,

Mat Johnson
DIRECTOR OF OPERATIONS
mjohnson@cultivationefficiency.com
408-827-5543
415-250-6204

ces
Cultivation
Efficiency Systems

Carbon dioxide

From Wikipedia, the free encyclopedia

Carbon dioxide (chemical formula CO_2) is a colorless and odorless gas vital to life on Earth. This naturally occurring chemical compound is composed of a carbon atom covalently double bonded to two oxygen atoms. Carbon dioxide exists in Earth's atmosphere as a trace gas at a concentration of about 0.04 percent (400 ppm) by volume.[3] Natural sources include volcanoes, hot springs and geysers, and it is freed from carbonate rocks by dissolution in water and acids. Because carbon dioxide is soluble in water, it occurs naturally in groundwater, rivers and lakes, in ice caps and glaciers and also in seawater. It is present in deposits of petroleum and natural gas.[4]

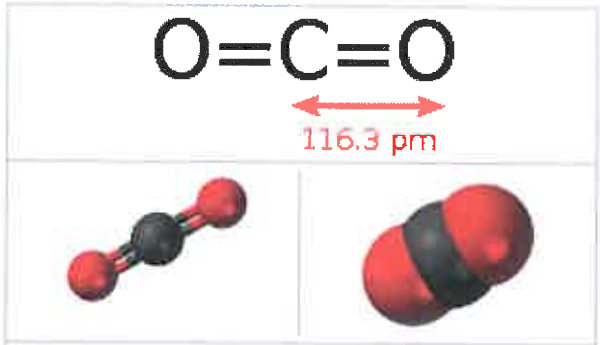
Atmospheric carbon dioxide is the primary source of carbon in life on Earth and its concentration in Earth's pre-industrial atmosphere since late in the Precambrian was regulated by photosynthetic organisms and geological phenomena. As part of the carbon cycle, plants, algae, and cyanobacteria use light energy to photosynthesize carbohydrate from carbon dioxide and water, with oxygen produced as a waste product.[5]

Carbon dioxide (CO_2) is produced by all aerobic organisms when they metabolize carbohydrate and lipids to produce energy by respiration.[6] It is returned to water via the gills of fish and to the air via the lungs of air-breathing land animals, including humans. Carbon dioxide is produced during the processes of decay of organic materials and the fermentation of sugars in bread, beer and winemaking. It is produced by combustion of wood, carbohydrates and fossil fuels such as coal, peat, petroleum and natural gas.

It is a versatile industrial material, used, for example, as an inert gas in welding and fire extinguishers, as a pressurizing gas in air guns and oil recovery, as a chemical feedstock and in liquid form as a solvent in decaffeination of coffee and supercritical drying. It is added to drinking water and carbonated beverages including beer and sparkling wine to add effervescence. The frozen solid form of CO_2, known as "dry ice" is used as a refrigerant and as an abrasive in dry-ice blasting.

Carbon dioxide is a significant greenhouse gas. Since the Industrial Revolution, anthropogenic emissions - including the burning of carbon-based fossil fuels and land use changes (primarily deforestation) - have rapidly increased its

Carbon dioxide



Names	
Other names	Carbonic acid gas Carbonic anhydride Carbonic oxide Carbon oxide Carbon(IV) oxide Dry ice (solid phase)
Identifiers	
CAS Number	124-38-9 (http://www.commonchemistry.org/ChemicalDetail.aspx?ref=124-38-9) ✓
3DMet	B01131 (http://www.3dmet.dna.affrc.go.jp/cgi/show_data.php?acc=B01131)
Beilstein Reference	1900390
ChEBI	CHEBI:16526 (https://www.ebi.ac.uk/chebi/searchId.do?chebiId=16526) ✓
ChEMBL	ChEMBL1231871 (https://www.ebi.ac.uk/chembldb/index.php/compound/inspect/ChEMBL1231871) ✗
ChemSpider	274 (http://www.chemspider.com/Chemical-Structure.274.html) ✓
EC Number	204-696-9
Gmelin Reference	989
Jmol 3D model	Interactive image (http://chemapps.stolaf.edu/jmol/jmol.php?m

concentration in the atmosphere, leading to global warming. It is also a major cause of ocean acidification because it dissolves in water to form carbonic acid.[7]

Contents

- 1 Background
- 2 Chemical and physical properties
  - 2.1 Structure and bonding
  - 2.2 In aqueous solution
  - 2.3 Chemical reactions of CO_2
  - 2.4 Physical properties
- 3 Isolation and production
- 4 Uses
  - 4.1 Precursor to chemicals
  - 4.2 Foods
    - 4.2.1 Beverages
    - 4.2.2 Wine making
  - 4.3 Inert gas
  - 4.4 Fire extinguisher
  - 4.5 Supercritical CO_2 as solvent
  - 4.6 Agricultural and biological applications
  - 4.7 Oil recovery
  - 4.8 Bio transformation into fuel
  - 4.9 Refrigerant
  - 4.10 Coal bed methane recovery
  - 4.11 Niche uses
- 5 In Earth's atmosphere
- 6 In the oceans
- 7 Biological role
  - 7.1 Photosynthesis and carbon fixation
  - 7.2 Toxicity
    - 7.2.1 Below 1%
    - 7.2.2 Ventilation
  - 7.3 Human physiology
    - 7.3.1 Content
    - 7.3.2 Transport in the blood
    - 7.3.3 Regulation of respiration
- 8 See also
- 9 References
- 10 Further reading
- 11 External links

Background

Carbon dioxide was the first gas to be described as a discrete substance. In about 1640,[8] the Flemish chemist Jan Baptist van Helmont observed that when he burned charcoal in a closed vessel, the mass of the resulting ash was much less than that of

	odel=O%3DC%3DO) Interactive image (http://chemapps.stolaf.edu/jmol/jmol.php?model=C%28%3DO%29%3DO)
KEGG	D00004 (http://www.kegg.jp/entry/D00004)
MeSH	Carbon+dioxide (https://www.nlm.nih.gov/cgi/mesh/2014/MB_cgi?mode=&term=Carbon+dioxide)
RTECS number	FF6400000
UNII	142M471B3J (http://fdasis.nlm.nih.gov/srs/srsdirect.jsp?regno=142M471B3J)
UN number	1013 (gas), 1845 (solid)
InChI	
SMILES	
	Properties
Chemical formula	CO_2
Molar mass	44.01 g·mol^{-1}
Appearance	Colorless gas
Odor	Odorless
Density	1562 kg/m^3 (solid at 1 atm and −78.5 °C) 1101 kg/m^3 (liquid at saturation −37°C) 1.977 kg/m^3 (gas at 1 atm and 0 °C)
Melting point	−56.6 °C; −69.8 °F; 216.6 K (Triple point at 5.1 atm)
Sublimation conditions	−78.5 °C; −109.2 °F; 194.7 K (1 atm)
Solubility in water	1.45 g/L at 25 °C (77 °F), 100 kPa
Vapor pressure	5.73 MPa (20 °C)
Acidity (pK_a)	6.35, 10.33
Refractive index (n_D)	1.00045
Viscosity	0.07 cP at −78.5 °C
Dipole moment	0 D
	Structure

Crystal structure of dry ice

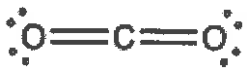
the original charcoal. His interpretation was that the rest of the charcoal had been transmuted into an invisible substance he termed a "gas" or "wild spirit" (*spiritus sylvestre*).[9]

The properties of carbon dioxide were studied more thoroughly in the 1750s by the Scottish physician Joseph Black. He found that limestone (calcium carbonate) could be heated or treated with acids to yield a gas he called "fixed air." He observed that the fixed air was denser than air and supported neither flame nor animal life. Black also found that when bubbled through limewater (a saturated aqueous solution of calcium hydroxide), it would precipitate calcium carbonate. He used this phenomenon to illustrate that carbon dioxide is produced by animal respiration and microbial fermentation. In 1772, English chemist Joseph Priestley published a paper entitled *Impregnating Water with Fixed Air* in which he described a process of dripping sulfuric acid (or *oil of vitriol* as Priestley knew it) on chalk in order to produce carbon dioxide, and forcing the gas to dissolve by agitating a bowl of water in contact with the gas.[10]

Carbon dioxide was first liquefied (at elevated pressures) in 1823 by Humphry Davy and Michael Faraday.[11] The earliest description of solid carbon dioxide was given by Adrien-Jean-Pierre Thilorier, who in 1835 opened a pressurized container of liquid carbon dioxide, only to find that the cooling produced by the rapid evaporation of the liquid yielded a "snow" of solid CO_2.[12][13]

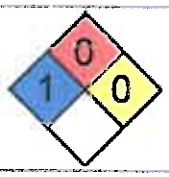
Chemical and physical properties

Structure and bonding



	O	C	O
Formal Charge	0	0	0
Oxidation State	2−	4+	2−

The carbon dioxide molecule is linear and centrosymmetric. The two C=O bonds are equivalent and are short (116.3 pm), consistent with double bonding.[14] Since it is centrosymmetric, the molecule has no electrical dipole. Consequently, only two vibrational bands are observed in the IR spectrum – an antisymmetric stretching mode at 2349 cm^{-1} and a degenerate

Crystal structure	trigonal
Molecular shape	linear
Thermochemistry	
Specific heat capacity (C)	37.135 J/K mol
Std molar entropy ($S^{\ominus}_{298}$)	214 $J \cdot mol^{-1} \cdot K^{-1}$
Std enthalpy of formation ($\Delta_f H^{\ominus}_{298}$)	−393.5 $kJ \cdot mol^{-1}$
Pharmacology	
ATC code	V03AN02 (WHO (http://www.whocc.no/atc_ddd_index/?code=V03AN02))
Hazards	
Safety data sheet	*See: data page* Sigma-Aldrich (http://www.sigmaaldrich.com/MSDS/MSDS/DisplayMSDSPage.do?country=PL&language=EN-generic&productNumber=295108&brand=ALDRICH&PageToGoToURL=http%3A%2F%2Fwww.sigmaaldrich.com%2Fcatalog%2Fproduct%2Faldrich%2F295108%3Flang%3Dpl)
NFPA 704	
Lethal dose or concentration (LD, LC):	
LC_{Lo} (lowest published)	90,000 ppm (human, 5 min)[2]
US health exposure limits (NIOSH):	
PEL (Permissible)	TWA 5000 ppm (9000 mg/m^3)[1]
REL (Recommended)	TWA 5000 ppm (9000 mg/m^3) ST 30,000 ppm (54,000 mg/m^3)[1]
IDLH (Immediate danger)	40,000 ppm[1]
Related compounds	
Other anions	Carbon disulfide Carbon diselenide Carbon ditelluride

pair of bending modes at 667 cm^{-1}. There is also a symmetric stretching mode at 1388 cm^{-1} which is only observed in the Raman spectrum.[15]

Other cations	Silicon dioxide Germanium dioxide Tin dioxide Lead dioxide
Related carbon oxides	Carbon monoxide Carbon suboxide Dicarbon monoxide Carbon trioxide
Related compounds	Carbonic acid Carbonyl sulfide

Except where otherwise noted, data are given for materials in their standard state (at 25 °C [77 °F], 100 kPa).

✗ verify (what is ✓✗ ?)

Infobox references

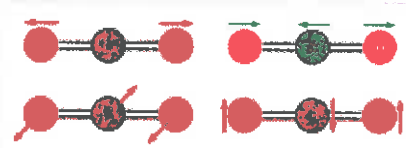
In aqueous solution

Carbon dioxide is soluble in water, in which it reversibly forms H_2CO_3 (carbonic acid), which is a weak acid since its ionization in water is incomplete.

$$CO_2 + H_2O \rightleftharpoons H_2CO_3$$

The hydration equilibrium constant of carbonic acid is $K_h = \frac{[H_2CO_3]}{[CO_2(aq)]} = 1.70 \times 10^{-3}$ (at 25 °C). Hence, the majority of the carbon dioxide is not converted into carbonic acid, but remains as CO_2 molecules, not affecting the pH.

The relative concentrations of CO_2, H_2CO_3, and the deprotonated forms HCO_3^- (bicarbonate) and CO_3^{2-}(carbonate) depend on the pH. As shown in a Bjerrum plot, in neutral or slightly alkaline water (pH > 6.5), the bicarbonate form predominates (>50%) becoming the most prevalent (>95%) at the pH of seawater. In very alkaline water (pH > 10.4), the predominant (>50%) form is carbonate. The oceans, being mildly alkaline with typical pH = 8.2–8.5, contain about 120 mg of bicarbonate per liter.



Stretching and bending oscillations of the CO_2 carbon dioxide molecule. Upper left: symmetric stretching. Upper right: antisymmetric stretching. Lower line: degenerate pair of bending modes.

Being diprotic, carbonic acid has two acid dissociation constants, the first one for the dissociation into the bicarbonate (also called hydrogen carbonate) ion (HCO_3^-):

$$H_2CO_3 \rightleftharpoons HCO_3^- + H^+$$

$K_{a1} = 2.5 \times 10^{-4}$ mol/L; $pK_{a1} = 3.6$ at 25 °C.[14]

This is the *true* first acid dissociation constant, defined as $K_{a1} = \frac{[HCO_3^-][H^+]}{[H_2CO_3]}$, where the denominator includes only covalently bound H_2CO_3 and does not include hydrated CO_2(aq). The much smaller and often-quoted value near 4.16×10^{-7} is an *apparent* value calculated on the (incorrect) assumption that all dissolved CO_2 is present as carbonic acid, so that $K_{a1}(\text{apparent}) = \frac{[HCO_3^-][H^+]}{[H_2CO_3] + [CO_2(aq)]}$. Since most of the dissolved CO_2 remains as CO_2 molecules, K_{a1}(apparent) has a much larger denominator and a much smaller value than the true K_{a1}.[16]

The bicarbonate ion is an amphoteric species that can act as an acid or as a base, depending on pH of the solution. At high pH, it dissociates significantly into the carbonate ion (CO_3^{2-}):

$$HCO_3^- \rightleftharpoons CO_3^{2-} + H^+$$

$K_{a2} = 4.69 \times 10^{-11}$ mol/L; $pK_{a2} = 10.329$

In organisms carbonic acid production is catalysed by the enzyme, carbonic anhydrase.

Chemical reactions of CO_2

CO_2 is a weak electrophile. Its reaction with basic water illustrates this property, in which case hydroxide is the nucleophile. Other nucleophiles react as well. For example, carbanions as provided by Grignard reagents and organolithium compounds react with CO_2 to give carboxylates:

$$MR + CO_2 \rightarrow RCO_2M$$

where M = Li or MgBr and R = alkyl or aryl.

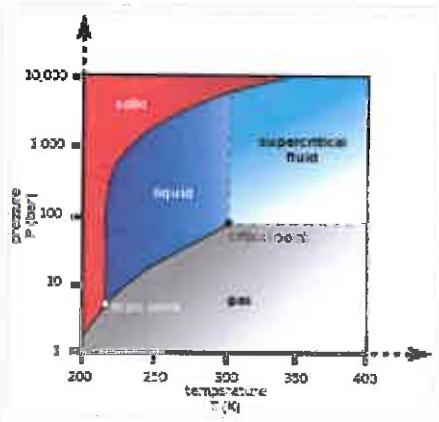
In metal carbon dioxide complexes, CO_2 serves as a ligand, which can facilitate the conversion of CO_2 to other chemicals.[17]

The reduction of CO_2 to CO is ordinarily a difficult and slow reaction:

$$CO_2 + 2\,e^- + 2H^+ \rightarrow CO + H_2O$$

The redox potential for this reaction near pH 7 is about −0.53 V *versus* the standard hydrogen electrode. The nickel-containing enzyme carbon monoxide dehydrogenase catalyses this process.[18]

Physical properties



Carbon dioxide pressure-temperature phase diagram showing the triple point and critical point of carbon dioxide

Carbon dioxide is colorless. At low concentrations, the gas is odorless. At higher concentrations it has a sharp, acidic odor. At standard temperature and pressure, the density of carbon dioxide is around 1.98 kg/m^3, about 1.67 times that of air.

Sample of solid carbon dioxide or "dry ice" pellets

Carbon dioxide has no liquid state at pressures below 5.1 standard atmospheres (520 kPa). At 1 atmosphere (near mean sea level pressure), the gas deposits directly to a solid at temperatures below −78.5 °C (−109.3 °F; 194.7 K) and the solid sublimes directly to a gas above −78.5 °C. In its solid state, carbon dioxide is commonly called dry ice.

Liquid carbon dioxide forms only at pressures above 5.1 atm; the triple point of carbon dioxide is about 518 kPa at −56.6 °C (see phase diagram at left). The critical point is 7.38 MPa at 31.1 °C.[19][20] Another form of solid carbon dioxide observed at high pressure is an amorphous glass-like solid.[21] This form of glass, called *carbonia*, is produced by supercooling heated CO_2 at extreme pressure (40–48 GPa or about 400,000 atmospheres) in a

diamond anvil. This discovery confirmed the theory that carbon dioxide could exist in a glass state similar to other members of its elemental family, like silicon (silica glass) and germanium dioxide. Unlike silica and germania glasses, however, carbonia glass is not stable at normal pressures and reverts to gas when pressure is released.

At temperatures and pressures above the critical point, carbon dioxide behaves as a supercritical fluid known as supercritical carbon dioxide.

Isolation and production

Carbon dioxide can be obtained by distillation from air, but the method is inefficient. Industrially, carbon dioxide is predominantly an unrecovered waste product, produced by several methods which may be practiced at various scales.[22]

The combustion of all carbon-based fuels, such as methane (natural gas), petroleum distillates (gasoline, diesel, kerosene, propane), coal, wood and generic organic matter produces carbon dioxide and, except in the case of pure carbon, water. As an example, the chemical reaction between methane and oxygen is given below.

$$CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$$

It is produced by thermal decomposition of limestone, $CaCO_3$ by heating (calcining) at about 850 °C (1,560 °F), in the manufacture of quicklime (calcium oxide, CaO), a compound that has many industrial uses:

$$CaCO_3 \rightarrow CaO + CO_2$$

Iron is reduced from its oxides with coke in a blast furnace, producing pig iron and carbon dioxide:[23]

Carbon dioxide is a byproduct of the industrial production of hydrogen by steam reforming and ammonia synthesis. These processes begin with the reaction of water and natural gas (mainly methane).[24]

Acids liberate CO_2 from most metal carbonates. Consequently, it may be obtained directly from natural carbon dioxide springs, where it is produced by the action of acidified water on limestone or dolomite. The reaction between hydrochloric acid and calcium carbonate (limestone or chalk) is shown below:

$$CaCO_3 + 2\ HCl \rightarrow CaCl_2 + H_2CO_3$$

The carbonic acid (H_2CO_3) then decomposes to water and CO_2:

$$H_2CO_3 \rightarrow CO_2 + H_2O$$

Such reactions are accompanied by foaming or bubbling, or both, as the gas is released. They have widespread uses in industry because they can be used to neutralize waste acid streams.

Carbon dioxide is a by-product of the fermentation of sugar in the brewing of beer, whisky and other alcoholic beverages and in the production of bioethanol. Yeast metabolizes sugar to produce CO_2 and ethanol, also known as alcohol, as follows:

$$C_6H_{12}O_6 \rightarrow 2\ CO_2 + 2\ C_2H_5OH$$

All aerobic organisms produce CO_2 when they oxidize carbohydrates, fatty acids, and proteins. The large number of reactions involved are exceedingly complex and not described easily. Refer to (cellular respiration, anaerobic respiration and photosynthesis). The equation for the respiration of glucose and other monosaccharides is:

$$C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$$

Photoautotrophs (i.e. plants and cyanobacteria) use the energy contained in sunlight to photosynthesize simple sugars from CO_2 absorbed from the air and water:

$$n\ CO_2 + n\ H_2O \rightarrow (CH_2O)_n + n\ O_2$$

Carbon dioxide comprises about 40-45% of the gas that emanates from decomposition in landfills (termed "landfill gas"). Most of the remaining 50-55% is methane.[25]

Uses

Carbon dioxide is used by the food industry, the oil industry, and the chemical industry.[22] The compound has varied commercial uses but one of its greatest use as a chemical is in the production of carbonated beverages; it provides the sparkle in carbonated beverages such as soda water.

Carbon dioxide bubbles in a soft drink.

Precursor to chemicals

In the chemical industry, carbon dioxide is mainly consumed as an ingredient in the production of urea, with a smaller fraction being used to produce methanol and a range of other products.[26] Metal carbonates and bicarbonates, as well as some carboxylic acids derivatives (e.g., sodium salicylate) are prepared using CO_2.

In addition to conventional processes using CO_2 for chemical production, electrochemical methods are also being explored at a research level. In particular, the use of renewable energy for production of fuels from CO_2 (such as methanol) is attractive as this could result in fuels that could be easily transported and used within conventional combustion technologies but have no net CO_2 emissions.[27]

Foods

Carbon dioxide is a food additive used as a propellant and acidity regulator in the food industry. It is approved for usage in the EU[28] (listed as E number E290), US[29] and Australia and New Zealand[30] (listed by its INS number 290).

A candy called Pop Rocks is pressurized with carbon dioxide gas at about 4×10^6 Pa (40 bar, 580 psi). When placed in the mouth, it dissolves (just like other hard candy) and releases the gas bubbles with an audible pop.

Leavening agents cause dough to rise by producing carbon dioxide. Baker's yeast produces carbon dioxide by fermentation of sugars within the dough, while chemical leaveners such as baking powder and baking soda release carbon dioxide when heated or if exposed to acids.

Beverages

Carbon dioxide is used to produce carbonated soft drinks and soda water. Traditionally, the carbonation of beer and sparkling wine came about through natural fermentation, but many manufacturers carbonate these drinks with carbon dioxide recovered from the fermentation process. In the case of bottled and kegged beer, the most common method used is carbonation with recycled carbon dioxide. With the exception of British Real Ale, draught beer is usually transferred from kegs in a cold room or cellar to dispensing taps on the bar using pressurized carbon dioxide, sometimes mixed with nitrogen.

Wine making

Carbon dioxide in the form of dry ice is often used in the wine making process to cool down clusters of grapes quickly after picking to help prevent spontaneous fermentation by wild yeast. The main advantage of using dry ice over regular water ice is that it cools the grapes without adding any additional water that may decrease the sugar concentration in the grape must, and therefore also decrease the alcohol concentration in the finished wine.

Dry ice is also used during the cold soak phase of the wine making process to keep grapes cool. The carbon dioxide gas that results from the sublimation of the dry ice tends to settle to the bottom of tanks because it is denser than air. The settled carbon dioxide gas creates a hypoxic environment which helps to prevent bacteria from growing on the grapes until it is time to start the fermentation with the desired strain of yeast.

Carbon dioxide is also used to create a hypoxic environment for carbonic maceration, the process used to produce Beaujolais wine.

Carbon dioxide is sometimes used to top up wine bottles or other storage vessels such as barrels to prevent oxidation, though it has the problem that it can dissolve into the wine, making a previously still wine slightly fizzy. For this reason, other gases such as nitrogen or argon are preferred for this process by professional wine makers.

Inert gas

It is one of the most commonly used compressed gases for pneumatic (pressurized gas) systems in portable pressure tools. Carbon dioxide is also used as an atmosphere for welding, although in the welding arc, it reacts to oxidize most metals. Use in the automotive industry is common despite significant evidence that welds made in carbon dioxide are more brittle than those made in more inert atmospheres, and that such weld joints deteriorate over time because of the formation of carbonic acid. It is used as a welding gas primarily because it is much less expensive than more inert gases such as argon or helium. When used for MIG welding, CO_2 use is sometimes referred to as MAG welding, for Metal Active Gas, as CO_2 can react at these high temperatures. It tends to produce a hotter puddle than truly inert atmospheres, improving the flow characteristics. Although, this may be due to atmospheric reactions occurring at the puddle site. This is usually the opposite of the desired effect when welding, as it tends to embrittle the site, but may not be a problem for general mild steel welding, where ultimate ductility is not a major concern.

It is used in many consumer products that require pressurized gas because it is inexpensive and nonflammable, and because it undergoes a phase transition from gas to liquid at room temperature at an attainable pressure of approximately 60 bar (870 psi, 59 atm), allowing far more carbon dioxide to fit in a given container than otherwise would. Life jackets often contain canisters of pressured carbon dioxide for quick inflation. Aluminium capsules of CO_2 are also sold as supplies of compressed gas for airguns, paintball markers, inflating bicycle tires, and for making carbonated water. Rapid vaporization of liquid carbon dioxide is used for blasting in coal mines. High concentrations of carbon dioxide can also be used to kill pests. Liquid carbon dioxide is used in supercritical drying of some food products and technological materials, in the preparation of specimens for scanning electron microscopy and in the decaffeination of coffee beans.

Fire extinguisher

Carbon dioxide can be used to extinguish flames by flooding the environment around the flame with the gas. It does not itself react to extinguish the flame, but starves the flame of oxygen by displacing it. Some fire extinguishers, especially those designed for electrical fires, contain liquid carbon dioxide under pressure. Carbon dioxide extinguishers work well on small flammable liquid and electrical fires, but not on ordinary combustible fires, because although it excludes oxygen, it does not cool the burning substances significantly and when the carbon dioxide disperses they are free to catch fire upon exposure to atmospheric oxygen. Their desirability in electrical fire stems from the fact that, unlike water or other chemical based methods, Carbon dioxide will not cause short circuits, leading to even more damage to equipment. Because it is a gas, it is also easy to dispense large amounts of the gas automatically in IT infrastructure rooms, where the fire itself might be hard to reach with more immediate methods because it is behind rack doors and inside of cases. Carbon dioxide has also been widely used as an extinguishing agent in fixed fire protection systems for local application of specific hazards and total flooding of a protected space.[31] International Maritime Organization standards also recognize carbon dioxide systems for fire protection of ship holds and engine rooms. Carbon dioxide based fire protection systems have been linked to several deaths, because it can cause suffocation in sufficiently high concentrations. A review of CO_2 systems identified 51 incidents between 1975 and the date of the report, causing 72 deaths and 145 injuries.[32]

Supercritical CO_2 as solvent

Liquid carbon dioxide is a good solvent for many lipophilic organic compounds and is used to remove caffeine from coffee. Carbon dioxide has attracted attention in the pharmaceutical and other chemical processing industries as a less toxic alternative to more traditional solvents such as organochlorides. It is used by some dry cleaners for this reason (see green chemistry). It is used in the preparation of some aerogels because of the properties of supercritical carbon dioxide.

Agricultural and biological applications

Plants require carbon dioxide to conduct photosynthesis. The atmospheres of greenhouses may (if of large size, must) be enriched with additional CO_2 to sustain and increase the rate of plant growth.[33][34] At very high concentrations (100 times atmospheric concentration, or greater), carbon dioxide can be toxic to animal life, so raising the concentration to 10,000 ppm (1%) or higher for several hours will eliminate pests such as whiteflies and spider mites in a greenhouse.[35]

In medicine, up to 5% carbon dioxide (130 times atmospheric concentration) is added to oxygen for stimulation of breathing after apnea and to stabilize the O_2/CO_2 balance in blood.

It has been proposed that carbon dioxide from power generation be bubbled into ponds to stimulate growth of algae that could then be converted into biodiesel fuel.[36]

Oil recovery

Carbon dioxide is used in enhanced oil recovery where it is injected into or adjacent to producing oil wells, usually under supercritical conditions, when it becomes miscible with the oil. This approach can increase original oil recovery by reducing residual oil saturation by between 7 per cent to 23 per cent additional to primary extraction.[37] It acts as both a pressurizing agent and, when dissolved into the underground crude oil, significantly

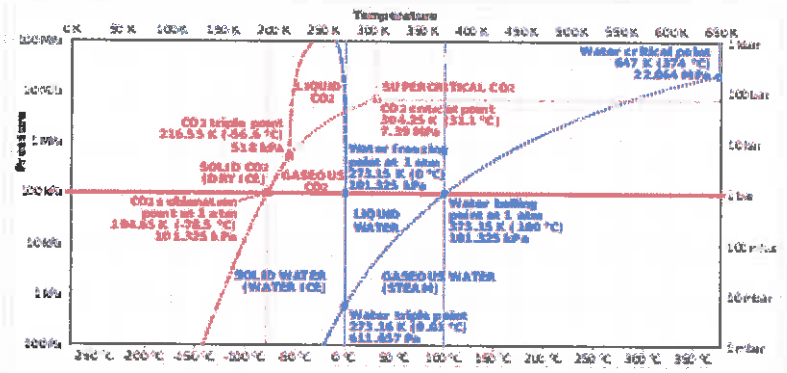
reduces its viscosity, and changing surface chemistry enabling the oil to flow more rapidly through the reservoir to the removal well.[38] In mature oil fields, extensive pipe networks are used to carry the carbon dioxide to the injection points.

Bio transformation into fuel

Researchers have genetically modified a strain of the cyanobacterium *Synechococcus elongatus* to produce the fuels isobutyraldehyde and isobutanol from CO_2 using photosynthesis.[39]

Refrigerant

Liquid and solid carbon dioxide are important refrigerants, especially in the food industry, where they are employed during the transportation and storage of ice cream and other frozen foods. Solid carbon dioxide is called "dry ice" and is used for small shipments where refrigeration equipment is not practical. Solid carbon dioxide is always below −78.5 °C at regular atmospheric pressure, regardless of the air temperature.



Comparison of phase diagrams of carbon dioxide (red) and water (blue) as a log-lin chart with phase transitions points at 1 atmosphere

Liquid carbon dioxide (industry nomenclature R744 or R-744) was used as a refrigerant prior to the discovery of R-12 and may enjoy a renaissance due to the fact that R134a contributes to climate change. Its physical properties are highly favorable for cooling, refrigeration, and heating purposes, having a high volumetric cooling capacity. Due to the need to operate at pressures of up to 130 bar (1880 psi), CO_2 systems require highly resistant components that have already been developed for mass production in many sectors. In automobile air conditioning, in more than 90% of all driving conditions for latitudes higher than 50°, R744 operates more efficiently than systems using R134a. Its environmental advantages (GWP of 1, non-ozone depleting, non-toxic, non-flammable) could make it the future working fluid to replace current HFCs in cars, supermarkets, and heat pump water heaters, among others. Coca-Cola has fielded CO_2-based beverage coolers and the U.S. Army is interested in CO_2 refrigeration and heating technology.[40][41]

The global automobile industry is expected to decide on the next-generation refrigerant in car air conditioning. CO_2 is one discussed option.(see Sustainable automotive air conditioning)

Coal bed methane recovery

In enhanced coal bed methane recovery, carbon dioxide would be pumped into the coal seam to displace methane, as opposed to current methods which primarily rely on the removal of water (to reduce pressure) to make the coal seam release its trapped methane.[42]

Niche uses

Carbon dioxide is the lasing medium in a carbon dioxide laser, which is one of the earliest type of lasers.

Carbon dioxide can be used as a means of controlling the pH of swimming pools, by continuously adding gas to the water, thus keeping the pH from rising. Among the advantages of this is the avoidance of handling (more hazardous) acids. Similarly, it is also used in the maintaining reef aquaria, where it is commonly used in calcium reactors to temporarily lower the pH of water being passed over calcium carbonate in order to allow the calcium carbonate to dissolve into the water more freely where it is used by some corals to build their skeleton.

A carbon dioxide laser.

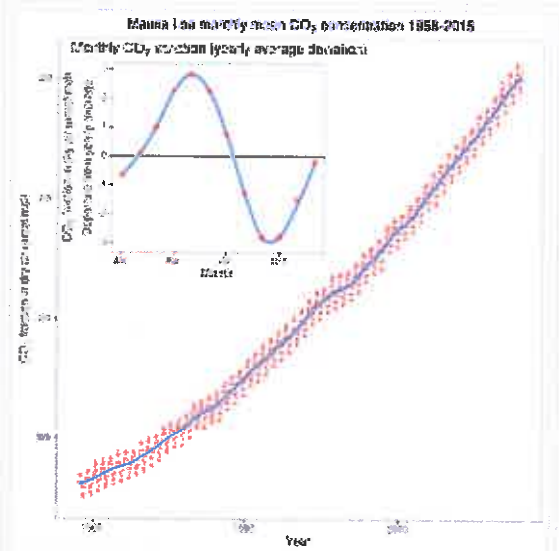
Used as the primary coolant in the British advanced gas-cooled reactor for nuclear power generation.

Carbon dioxide induction is commonly used for the euthanasia of laboratory research animals. Methods to administer CO_2 include placing animals directly into a closed, prefilled chamber containing CO_2, or exposure to a gradually increasing concentration of CO_2. In 2013, the American Veterinary Medical Association issued new guidelines for carbon dioxide induction, stating that a displacement rate of 10% to 30% of the gas chamber volume per minute is optimal for the humane euthanization of small rodents.[43]

Carbon dioxide is also used in several related cleaning and surface preparation techniques.

In Earth's atmosphere

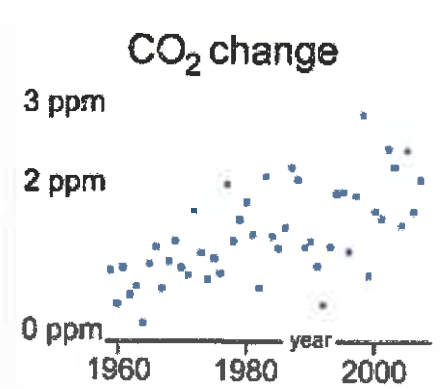
Carbon dioxide in Earth's atmosphere is a trace gas, currently (early 2016) having an average concentration of 402 parts per million by volume[3][44][45] (or 611 parts per million by mass). Atmospheric concentrations of carbon dioxide fluctuate slightly with the seasons, falling during the Northern Hemisphere spring and summer as plants consume the gas and rising during northern autumn and winter as plants go dormant or die and decay. Concentrations also vary on a regional basis, most strongly near the ground with much smaller variations aloft. In urban areas concentrations are generally higher[46] and indoors they can reach 10 times background levels.



The Keeling Curve of atmospheric CO_2 concentrations measured at Mauna Loa Observatory

Combustion of fossil fuels and deforestation have caused the atmospheric concentration of carbon dioxide to increase by about 43% since the beginning of the age of industrialization.[48] Most carbon dioxide from human activities is released from burning coal and other fossil fuels. Other human activities, including deforestation, biomass burning, and cement production also produce carbon dioxide. Volcanoes emit between 0.2 and 0.3 billion tons of carbon dioxide per year, while human activities emit about 29 billion tons.[49]

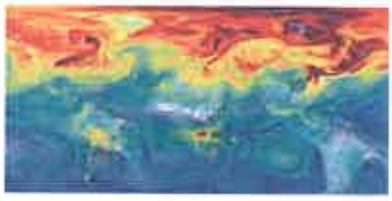
Carbon dioxide is a greenhouse gas, absorbing and emitting infrared radiation at its two infrared-active vibrational frequencies (see Structure and bonding above). This process causes carbon dioxide to warm the surface and lower atmosphere, while cooling the upper atmosphere. The increase in atmospheric concentration of CO_2, and thus in the CO_2-induced greenhouse effect, is the reason for the rise in average global temperature since the mid-20th



Yearly increase of atmospheric CO_2: In the 1960s, the average annual increase was 37% of the 2000–2007 average.[47]

century. Although carbon dioxide is the greenhouse gas primarily responsible for the rise, methane, nitrous oxide, ozone, and various other long-lived greenhouse gases also contribute. Carbon dioxide is of greatest concern because it exerts a larger overall warming influence than all of those other gases combined, and because it has a long atmospheric lifetime.

Not only do increasing carbon dioxide concentrations lead to increases in global surface temperature, but increasing global temperatures also cause increasing concentrations of carbon dioxide. This produces a positive feedback for changes induced by other processes such as orbital cycles.[54] Five hundred million years ago the carbon dioxide concentration was 20 times greater than today, decreasing to 4–5 times during the Jurassic period and then slowly declining with a particularly swift reduction occurring 49 million years ago.[55][56]


CO_2 in Earth's atmosphere if *half* of global-warming emissions are *not* absorbed.[50][51][52][53] (NASA computer simulation).

Local concentrations of carbon dioxide can reach high values near strong sources, especially those that are isolated by surrounding terrain. At the Bossoleto hot spring near Rapolano Terme in Tuscany, Italy, situated in a bowl-shaped depression about 100 m (330 ft) in diameter, concentrations of CO_2 rise to above 75% overnight, sufficient to kill insects and small animals. After sunrise the gas is dispersed by convection during the day.[57] High concentrations of CO_2 produced by disturbance of deep lake water saturated with CO_2 are thought to have caused 37 fatalities at Lake Monoun, Cameroon in 1984 and 1700 casualties at Lake Nyos, Cameroon in 1986.[58]

On November 12, 2015, NASA scientists reported that human-made carbon dioxide (CO_2) continues to increase above levels not seen in hundreds of thousands of years: currently, about half of the carbon dioxide released from the burning of fossil fuels remains in the atmosphere and is not absorbed by vegetation and the oceans.[50][51][52][53]

In the oceans

Carbon dioxide dissolves in the ocean to form carbonic acid (H_2CO_3), bicarbonate (HCO_3^-) and carbonate (CO_3^{2-}). There is about fifty times as much carbon dissolved in the oceans as exists in the atmosphere. The oceans act as an enormous carbon sink, and have taken up about a third of CO_2 emitted by human activity.[59]

As the concentration of carbon dioxide increases in the atmosphere, the increased uptake of carbon dioxide into the oceans is causing a measurable decrease in the pH of the oceans, which is referred to as ocean acidification. This reduction in pH affects biological systems in the oceans, primarily oceanic calcifying organisms. These effects span the food chain from autotrophs to heterotrophs and include organisms such as coccolithophores, corals, foraminifera, echinoderms, crustaceans and mollusks. Under normal conditions, calcium carbonate is stable in surface waters since the carbonate ion is at supersaturating concentrations. However, as ocean pH falls, so does the concentration of this ion, and when carbonate becomes undersaturated, structures made of calcium carbonate are vulnerable to dissolution.[60] Corals,[61][62][63] coccolithophore algae,[64][65][66][67] coralline algae,[68] foraminifera,[69] shellfish[70] and pteropods[71] experience reduced calcification or enhanced dissolution when exposed to elevated CO_2.

Gas solubility decreases as the temperature of water increases (except when both pressure exceeds 300 bar and temperature exceeds 393 K, only found near deep geothermal vents)[72] and therefore the rate of uptake from the atmosphere decreases as ocean temperatures rise.

Most of the CO_2 taken up by the ocean, which is about 30% of the total released into the atmosphere,[73] forms carbonic acid in equilibrium with bicarbonate. Some of these chemical species are consumed by photosynthetic organisms that remove carbon from the cycle. Increased CO_2 in the atmosphere has led to decreasing alkalinity of seawater, and there is concern that this may adversely affect organisms living in the water. In particular, with decreasing alkalinity, the availability of carbonates for forming shells decreases,[74] although there's evidence of increased shell production by certain species under increased CO_2 content.[75]

NOAA states in their May 2008 "State of the science fact sheet for ocean acidification" that:
"The oceans have absorbed about 50% of the carbon dioxide (CO_2) released from the burning of fossil fuels, resulting in chemical reactions that lower ocean pH. This has caused an increase in hydrogen ion (acidity) of about 30% since the start of the industrial age through a process known as "ocean acidification." A growing number of studies have demonstrated adverse impacts on marine organisms, including:

- The rate at which reef-building corals produce their skeletons decreases, while production of numerous varieties of jellyfish increases.
- The ability of marine algae and free-swimming zooplankton to maintain protective shells is reduced.
- The survival of larval marine species, including commercial fish and shellfish, is reduced."

Also, the Intergovernmental Panel on Climate Change (IPCC) writes in their Climate Change 2007: Synthesis Report:[76]
"The uptake of anthropogenic carbon since 1750 has led to the ocean becoming more acidic with an average decrease in pH of 0.1 units. Increasing atmospheric CO_2 concentrations lead to further acidification ... While the effects of observed ocean acidification on the marine biosphere are as yet undocumented, the progressive acidification of oceans is expected to have negative impacts on marine shell-forming organisms (e.g. corals) and their dependent species."

Some marine calcifying organisms (including coral reefs) have been singled out by major research agencies, including NOAA, OSPAR commission, NANOOS and the IPCC, because their most current research shows that ocean acidification should be expected to impact them negatively.[77]

Carbon dioxide is also introduced into the oceans through hydrothermal vents. The *Champagne* hydrothermal vent, found at the Northwest Eifuku volcano at Marianas Trench Marine National Monument, produces almost pure liquid carbon dioxide, one of only two known sites in the world.[78]

Biological role

Carbon dioxide is an end product of cellular respiration in organisms that obtain energy by breaking down sugars, fats and amino acids with oxygen as part of their metabolism. This includes all plants, algae and animals and aerobic fungi and bacteria. In vertebrates, the carbon dioxide travels in the blood from the body's tissues to the skin (e.g., amphibians) or the gills (e.g., fish), from where it dissolves in the water, or to the lungs from where it is exhaled. During active photosynthesis, plants can absorb more carbon dioxide from the atmosphere than they release in respiration.

Photosynthesis and carbon fixation

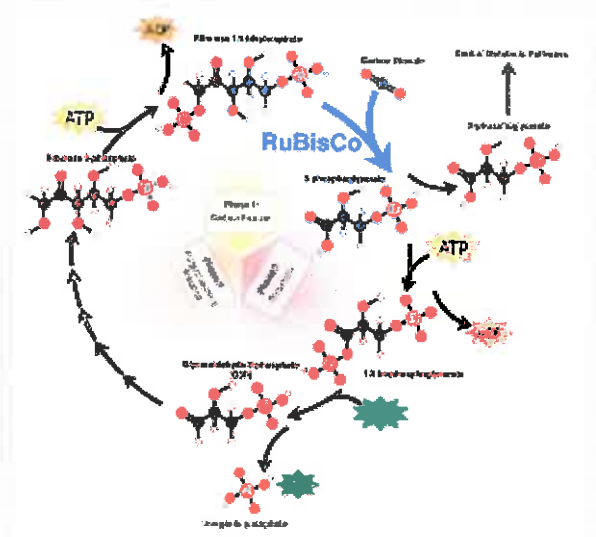
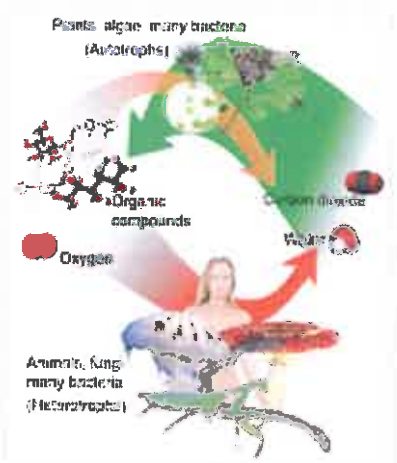


Figure 2. Overview of the Calvin cycle and carbon fixation

Carbon fixation is a biochemical process by which atmospheric carbon dioxide is incorporated by plants, algae and (cyanobacteria) into energy-rich organic molecules such as glucose, thus creating their own food by photosynthesis. Photosynthesis uses carbon dioxide and water to produce sugars from which other organic compounds can be constructed, and oxygen is produced as a by-product.



Overview of photosynthesis and respiration. Carbon dioxide (at right), together with water, form oxygen and organic compounds (at left) by photosynthesis, which can be respired to water and (CO_2).

Ribulose-1,5-bisphosphate carboxylase oxygenase, commonly abbreviated to RuBisCO, is the enzyme involved in the first major step of carbon fixation, the production of two molecules of 3-phosphoglycerate from CO_2 and ribulose bisphosphate, as shown in the diagram at left.

RuBisCO is thought to be the single most abundant protein on Earth.[79]

Phototrophs use the products of their photosynthesis as internal food sources and as raw material for the biosynthesis of more complex organic molecules, such as polysaccharides, nucleic acids and proteins. These are used for their own growth, and also as the basis of the food chains and webs that feed other organisms, including animals such as ourselves. Some important phototrophs, the coccolithophores synthesise hard calcium carbonate scales. A globally significant species of coccolithophore is *Emiliania huxleyi* whose calcite scales have formed the basis of many sedimentary rocks such as limestone, where what was previously atmospheric carbon can remain fixed for geological timescales.

Plants can grow as much as 50 percent faster in concentrations of 1,000 ppm CO_2 when compared with ambient conditions, though this assumes no change in climate and no limitation on other nutrients.[80] Elevated CO_2 levels cause increased growth reflected in the harvestable yield of crops, with wheat, rice and soybean all showing increases in yield of 12–14% under elevated CO_2 in FACE experiments.[81][82]

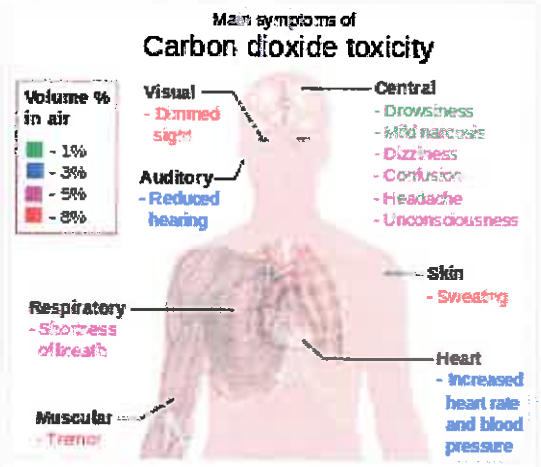
Increased atmospheric CO_2 concentrations result in fewer stomata developing on plants[83] which leads to reduced water usage and increased water-use efficiency.[84] Studies using FACE have shown that CO_2 enrichment leads to decreased concentrations of micronutrients in crop plants.[85] This may have knock-on effects on other parts of ecosystems as herbivores will need to eat more food to gain the same amount of protein.[86]

The concentration of secondary metabolites such as phenylpropanoids and flavonoids can also be altered in plants exposed to high concentrations of CO_2.[87][88]

Plants also emit CO_2 during respiration, and so the majority of plants and algae, which use C3 photosynthesis, are only net absorbers during the day. Though a growing forest will absorb many tons of CO_2 each year, a mature forest will produce as much CO_2 from respiration and decomposition of dead specimens (e.g., fallen branches) as is used in photosynthesis in growing plants.[89] Contrary to the long-standing view that they are carbon neutral, mature forests can continue to accumulate carbon[90] and remain valuable carbon sinks, helping to maintain the carbon balance of Earth's atmosphere. Additionally, and crucially to life on earth, photosynthesis by phytoplankton consumes dissolved CO_2 in the upper ocean and thereby promotes the absorption of CO_2 from the atmosphere.[91]

Toxicity

Carbon dioxide content in fresh air (averaged between sea-level and 10 kPa level, i.e., about 30 km (19 mi) altitude) varies between 0.036% (360 ppm) and 0.041% (410 ppm), depending on the location.[93]



Main symptoms of carbon dioxide toxicity, by increasing volume percent in air.[92]

CO_2 is an asphyxiant gas and not classified as toxic or harmful in accordance with Globally Harmonized System of Classification and Labelling of Chemicals standards of United Nations Economic Commission for Europe by using the OECD Guidelines for the Testing of Chemicals. In concentrations up to 1% (10,000 ppm), it will make some people feel drowsy and give the lungs a stuffy feeling.[92] Concentrations of 7% to 10% (70,000 to 100,000 ppm) may cause suffocation, even in the presence of sufficient oxygen, manifesting as dizziness, headache, visual and hearing dysfunction, and unconsciousness within a few minutes to an hour.[94] The physiological effects of acute carbon dioxide exposure are grouped together under the term hypercapnia, a subset of asphyxiation.

Because it is heavier than air, in locations where the gas seeps from the ground (due to sub-surface volcanic or geothermal activity) in relatively high concentrations, without the dispersing effects of wind, it can collect in sheltered/pocketed locations below average ground level, causing animals located therein to be suffocated. Carrion feeders attracted to the carcasses are then also killed. Children have been killed in the same way near the city of Goma by CO_2 emissions from the nearby volcano Mt. Nyiragongo.[95] The Swahili term for this phenomenon is 'mazuku'.

Adaptation to increased concentrations of CO_2 occurs in humans, including modified breathing and kidney bicarbonate production, in order to balance the effects of blood acidification (acidosis). Several studies suggested that 2.0 percent inspired concentrations could be used for closed air spaces (e.g. a submarine) since the adaptation is physiological and reversible, as decrement in performance or in normal physical activity does not happen at this level of exposure for five days.[96][97] Yet, other studies show a decrease in cognitive function even at much lower levels.[98][99] Also, with ongoing respiratory acidosis, adaptation or compensatory mechanisms will be unable to reverse such condition.

Below 1%

There are few studies of the health effects of long-term continuous CO_2 exposure on humans and animals at levels below 1% and there is potentially a significant risk to humans in the near future with rising atmospheric CO_2 levels associated with climate change.[100] Occupational CO_2 exposure limits have been set in the United States at 0.5% (5000 ppm) for an eight-hour period.[101] At this CO_2 concentration, International Space Station crew experienced headaches, lethargy, mental slowness, emotional irritation, and sleep disruption.[102] Studies in animals at 0.5% CO_2 have demonstrated kidney calcification and bone loss after eight weeks of exposure.[103] A study of humans exposed in 2.5 hour sessions demonstrated significant effects on cognitive abilities at concentrations as low as 0.1% (1000ppm) CO_2 likely due to CO_2 induced increases in cerebral blood flow.[98] Another study observed a decline in basic activity level and information usage at 1000 ppm, when compared to 500 ppm.[99]

Ventilation

Poor ventilation is one of the main causes of excessive CO_2 concentrations in closed spaces. Carbon dioxide differential above outdoor concentrations at steady state conditions (when the occupancy and ventilation system operation are sufficiently long that CO_2 concentration has stabilized) are sometimes used to estimate ventilation rates per person. Higher CO_2 concentrations are associated with occupant health, comfort and performance degradation. ASHRAE Standard 62.1–2007 ventilation rates may result in indoor levels up to 2,100 ppm above ambient outdoor conditions. Thus if the outdoor concentration is 400 ppm, indoor concentrations may reach 2,500 ppm with ventilation rates that meet this industry consensus standard. Concentrations in poorly ventilated spaces can be found even higher than this (range of 3,000 or 4,000).

Miners, who are particularly vulnerable to gas exposure due to an insufficient ventilation, referred to mixtures of carbon dioxide and nitrogen as "blackdamp," "choke damp" or "stythe." Before more effective technologies were developed, miners would frequently monitor for dangerous levels of blackdamp and other gases in mine shafts by bringing a caged canary with them as they worked. The canary is more sensitive to asphyxiant gases than humans, and as it became unconscious would stop singing and fall off its perch. The Davy lamp could also detect high levels of blackdamp (which sinks, and collects near the floor) by burning less brightly, while methane, another suffocating gas and explosion risk, would make the lamp burn more brightly.

Human physiology

Content

The body produces approximately 2.3 pounds (1.0 kg) of carbon dioxide per day per person,[104] containing 0.63 pounds (290 g) of carbon. In humans, this carbon dioxide is carried through the venous system and is breathed out through the lungs, resulting in lower concentrations in the arteries. The carbon dioxide content of the blood is often given as the partial pressure, which is the pressure which carbon dioxide would have had if it alone occupied the volume.[105]

In humans, the carbon dioxide contents are as follows:

Reference ranges or averages for partial pressures of carbon dioxide (abbreviated PCO_2)

Unit	Venous blood gas	Alveolar pulmonary gas pressures	Arterial blood carbon dioxide
kPa	5.5[106]–6.8[106]	4.8	4.7[106]–6.0[106]
mmHg	41–51	36	35[107]–45[107]

Transport in the blood

CO_2 is carried in blood in three different ways. (The exact percentages vary depending whether it is arterial or venous blood).

- Most of it (about 70% to 80%) is converted to bicarbonate ions HCO_3^- by the enzyme carbonic anhydrase in the red blood cells,[108] by the reaction $CO_2 + H_2O \rightarrow H_2CO_3 \rightarrow H^+ + HCO_3^-$.
- 5% – 10% is dissolved in the plasma[108]
- 5% – 10% is bound to hemoglobin as carbamino compounds[108]

Hemoglobin, the main oxygen-carrying molecule in red blood cells, carries both oxygen and carbon dioxide. However, the CO_2 bound to hemoglobin does not bind to the same site as oxygen. Instead, it combines with the N-terminal groups on the four globin chains. However, because of allosteric effects on the hemoglobin molecule, the binding of CO_2 decreases the amount of oxygen that is bound for a given partial pressure of oxygen. The decreased binding to carbon dioxide in the blood due to increased oxygen levels is known as the Haldane Effect, and is important in the transport of carbon dioxide from the tissues to the lungs. Conversely, a rise in the partial pressure of CO_2 or a lower pH will cause offloading of oxygen from hemoglobin, which is known as the Bohr Effect.

Regulation of respiration

Carbon dioxide is one of the mediators of local autoregulation of blood supply. If its concentration is high, the capillaries expand to allow a greater blood flow to that tissue.

Bicarbonate ions are crucial for regulating blood pH. A person's breathing rate influences the level of CO_2 in their blood. Breathing that is too slow or shallow causes respiratory acidosis, while breathing that is too rapid leads to hyperventilation, which can cause respiratory alkalosis.

Although the body requires oxygen for metabolism, low oxygen levels normally do not stimulate breathing. Rather, breathing is stimulated by higher carbon dioxide levels. As a result, breathing low-pressure air or a gas mixture with no oxygen at all (such as pure nitrogen) can lead to loss of consciousness without ever experiencing air hunger. This is especially perilous for high-altitude fighter pilots. It is also why flight attendants instruct passengers, in case of loss of cabin pressure, to apply the oxygen mask to themselves first before helping others; otherwise, one risks losing consciousness.[108]

The respiratory centers try to maintain an arterial CO_2 pressure of 40 mm Hg. With intentional hyperventilation, the CO_2 content of arterial blood may be lowered to 10–20 mm Hg (the oxygen content of the blood is little affected), and the respiratory drive is diminished. This is why one can hold one's breath longer after hyperventilating than without hyperventilating. This carries the risk that unconsciousness may result before the need to breathe becomes overwhelming, which is why hyperventilation is particularly dangerous before free diving.

See also

- Acidosis
- Alkalosis
- Arterial blood gas
- Bosch reaction
- Bottled gas
- Carbogen
- Carbon dioxide sensor
- Carbon sequestration
- Chemical equilibrium
- EcoCute – As refrigerants
- Emission standards
- Indoor_air_quality
- Kaya identity
- Lake Kivu
- List of least carbon efficient power stations
- List of countries by carbon dioxide emissions
- Meromictic lake
- pCO2
- pH
- pKa
- Sabatier reaction
- Gilbert Plass (early work on CO_2 and climate change)

References

1. "NIOSH Pocket Guide to Chemical Hazards #0103". National Institute for Occupational Safety and Health (NIOSH).
2. "Carbon dioxide". *Immediately Dangerous to Life and Health*. National Institute for Occupational Safety and Health (NIOSH).
3. National Oceanic & Atmospheric Administration (NOAA) – Earth System Research Laboratory (ESRL), Trends in Carbon Dioxide (http://www.esrl.noaa.gov/gmd/ccgg/trends/#mlo) Values given are dry air mole fractions expressed in parts per million (ppm). For an ideal gas mixture this is equivalent to parts per million by volume (ppmv).
4. "General Properties and Uses of Carbon Dioxide, Good Plant Design and Operation for Onshore Carbon Capture Installations and Onshore Pipelines". Energy Institute. Retrieved 2012-03-14.
5. Donald G. Kaufman; Cecilia M. Franz (1996). *Biosphere 2000: protecting our global environment*. Kendall/Hunt Pub. Co. ISBN 978-0-7872-0460-0. Retrieved 11 October 2011.
6. Food Factories (http://www.legacyproject.org/activities/foodfactories.html). www.legacyproject.org. Retrieved 2011-10-10.
7. *Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean*. Washington, DC: National Academies Press. doi:10.17226/12904. ISBN 978-0-309-15359-1.
8. DavidFraser Harris (September 1910). "THE PIONEER IN THE HYGIENE OF VENTILATIO". *The Lancet*. **176** (4542): 906–908. doi:10.1016/S0140-6736(00)52420-9.
9. Almqvist, Ebbe (2003). *History of industrial gases*. Springer. ISBN 9780306472770. p. 93
10. Priestley, Joseph; Hey, Wm (1772). "Observations on Different Kinds of Air". *Philosophical Transactions*. **62**: 147–264. doi:10.1098/rstl.1772.0021.
11. Davy, Humphry (1823). "On the Application of Liquids Formed by the Condensation of Gases as Mechanical Agents". *Philosophical Transactions*. **113**: 199–205. doi:10.1098/rstl.1823.0020. JSTOR 107649.
12. Thilorier, Adrien-Jean-Pierre (1835) "Solidification de l'acide carbonique" (http://gallica.bnf.fr/ark:/12148/bpt6k29606/f194.image.langEN) (Solidification of carbonic acid), *Comptes rendus* ..., **1** : 194–196
13. "Solidification of carbonic acid" (https://books.google.com/books?id=4GwqAAAAYAAJ&pg=PA446), *The London and Edinburgh Philosophical Magazine*, **8** : 446–447 (1836).
14. Greenwood, Norman N.; Earnshaw, Alan (1997). *Chemistry of the Elements* (2nd ed.). Butterworth-Heinemann. ISBN 0-08-037941-9.
15. Atkins P. and de Paula J. *Physical Chemistry* (8th ed., W.H. Freeman 2006) p.461 and p.464 ISBN 0-7167-8759-8
16. Jolly, William L., *Modern Inorganic Chemistry* (McGraw-Hill 1984), p. 196
17. M. Aresta (Ed.) "Carbon Dioxide as a Chemical Feedstock" 2010, Wiley-VCH: Weinheim. ISBN 978-3-527-32475-0
18. Finn, Colin; Schnittger, Sorcha; Yellowlees, Lesley J.; Love, Jason B. (2012). "Molecular approaches to the electrochemical reduction of carbon dioxide". *Chemical Communications*. **2011** (10): 1392–9. doi:10.1039/c1cc15393e. PMID 22116300.
19. "Phase change data for Carbon dioxide". National Institute of Standards and Technology. Retrieved 2008-01-21.

20. Kudryavtseva I.V., Kamotskii V.I., Rykov S.V., Rykov V.A., "CALCULATION CARBON DIOXIDE LINE OF PHASE EQUILIBRIUM" (http://processes.ihbt.ifmo.ru/en/article/10734/Calculation_carbon_dioxide_line_of_phase_equilibrium.htm), Processes and equipment for food production, Number 4(18), 2013
21. Santoro, M.; Gorelli, FA; Bini, R; Ruocco, G; Scandolo, S; Crichton, WA (2006). "Amorphous silica-like carbon dioxide". *Nature*. **441** (7095): 857–860. Bibcode:2006Natur.441..857S. doi:10.1038/nature04879. PMID 16778885.
22. Pierantozzi, Ronald (2001). "Carbon Dioxide". *Kirk-Othmer Encyclopedia of Chemical Technology. Kirk-Othmer Encyclopedia of Chemical Technology*. Wiley. doi:10.1002/0471238961.0301180216090518.a01.pub2. ISBN 0-471-23896-1.
23. Strassburger, Julius (1969). *Blast Furnace Theory and Practice*. New York: American Institute of Mining, Metallurgical, and Petroleum Engineers. ISBN 0-677-10420-0.
24. Susan Topham "Carbon Dioxide" in Ullmann's Encyclopedia of Industrial Chemistry, 2005, Wiley-VCH, Weinheim. doi:10.1002/14356007.a05_165 (https://dx.doi.org/10.1002%2F14356007.a05_165)
25. US EPA, "Facts About Landfill Gas" (http://www.dem.ri.gov/programs/benviron/waste/central/lfgfact.pdf)
26. "IPCC Special Report on Carbon dioxide Capture and Storage" (https://www.ipcc.ch/pdf/special-reports/srccs/srccs_chapter7.pdf)
27. Badwal, Sukhvinder P. S.; Giddey, Sarbjit S.; Munnings, Christopher; Bhatt, Anand I.; Hollenkamp, Anthony F. (24 September 2014). "Emerging electrochemical energy conversion and storage technologies (open access)". *Frontiers in Chemistry*. **2**: 79. Bibcode:2014FrCh....2...79B. doi:10.3389/fchem.2014.00079. PMC 4174133. PMID 25309898.
28. UK Food Standards Agency: "Current EU approved additives and their E Numbers". Retrieved 2011-10-27.
29. US Food and Drug Administration: "Food Additive Status List". Retrieved 13 June 2015.
30. Australia New Zealand Food Standards Code"Standard 1.2.4 – Labelling of ingredients". Retrieved 2011-10-27.
31. National Fire Protection Association Code 12
32. Carbon Dioxide as a Fire Suppressant: Examining the Risks, US EPA
33. Plant Growth Factors: Photosynthesis, Respiration, and Transpiration (http://www.ext.colostate.edu/mg/gardennotes/141.html). Ext.colostate.edu. Retrieved 2011-10-10.
34. Carbon dioxide (http://www-formal.stanford.edu/jmc/nature/node21.html). Formal.stanford.edu. Retrieved 2011-10-10.
35. Stafford, Ned (7 February 2007). "Future crops: The other greenhouse effect". *Nature*. **448** (7153): 526–8. Bibcode:2007Natur.448..526S. doi:10.1038/448526a. PMID 17671477.
36. Clayton, Mark (2006-01-11). "Algae – like a breath mint for smokestacks". *The Christian Science Monitor*. Retrieved 2007-10-11.
37. "CO_2 for use in enhanced oil recovery (EOR)". Global CCS Institute. Retrieved 2012-02-25.
38. Austell, J Michael (2005). "CO_2 for Enhanced Oil Recovery Needs – Enhanced Fiscal Incentives". *Exploration & Production: the Oil & Gas Review*. Archived from the original on 2012-02-07. Retrieved 2007-09-28.
39. Atsum, Shota; Higashide, Wendy; Liauo, James C. (November 2009). "Direct photosynthetic recycling of carbon dioxide to isobutyraldehyde". *Nature Biotechnology*. **27** (12): 1177–1180. doi:10.1038/nbt.1586. PMID 19915552.
40. "The Coca-Cola Company Announces Adoption of HFC-Free Insulation in Refrigeration Units to Combat Global Warming". The Coca-Cola Company. 2006-06-05. Retrieved 2007-10-11.
41. "Modine reinforces its CO_2 research efforts". R744.com. 2007-06-28.
42. "Enhanced coal bed methane recovery". ETH Zurich. 2006-08-31.
43. "2013 AVMA Guidelines for the Euthanasia of Animals" (PDF). Retrieved 2014-01-14.
44. Pashley, Alex (10 March 2016). "CO2 levels make largest recorded annual leap, Noaa data shows". The Guardian. Retrieved 14 March 2016.
45. "Record annual increase of carbon dioxide observed at Mauna Loa for 2015". NOAA. 9 March 2016. Retrieved 14 March 2016.
46. George, K.; Ziska, L. H.; Bunce, J. A.; Quebedeaux, B. (2007). "Elevated atmospheric CO2 concentration and temperature across an urban–rural transect". *Atmospheric Environment*. **41** (35): 7654–7665. Bibcode:2007AtmEn..41.7654G. doi:10.1016/j.atmosenv.2007.08.018.
47. Tans, Pieter (3 May 2008) "Annual CO_2 mole fraction increase (ppm)" for 1959–2007 (ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2_gr_mlo.txt). National Oceanic and Atmospheric Administration Earth System Research Laboratory, Global Monitoring Division (additional details (http://www.esrl.noaa.gov/gmd/ccgg/trends/).)
48. "After two large annual gains, rate of atmospheric CO_2 increase returns to average". NOAA News Online, Story 2412. 2005-03-31.
49. "Global Warming Frequently Asked Questions - NOAA Climate.gov".
50. Buis, Alan; Ramsayer, Kate; Rasmussen, Carol (12 November 2015). "A Breathing Planet, Off Balance". *NASA*. Retrieved 13 November 2015.
51. Staff (12 November 2015). "Audio (66:01) - NASA News Conference - Carbon & Climate Telecon". *NASA*. Retrieved 12 November 2015.

52. St. Fleur, Nicholas (10 November 2015). "Atmospheric Greenhouse Gas Levels Hit Record, Report Says". *New York Times*. Retrieved 11 November 2015.
53. Ritter, Karl (9 November 2015). "UK: In 1st, global temps average could be 1 degree C higher". *AP News*. Retrieved 11 November 2015.
54. Genthon, G.; Barnola, J. M.; Raynaud, D.; Lorius, C.; Jouzel, J.; Barkov, N. I.; Korotkevich, Y. S.; Kotlyakov, V. M. (1987). "Vostok ice core: climatic response to CO2 and orbital forcing changes over the last climatic cycle". *Nature*. **329** (6138): 414–418. Bibcode:1987Natur.329..414G. doi:10.1038/329414a0.
55. "Climate and CO_2 in the Atmosphere". Retrieved 2007-10-10.
56. Berner, Robert A.; Kothavala, Zavareth (2001). "GEOCARB III: A revised model of atmospheric CO_2 over Phanerozoic Time" (PDF). *American Journal of Science*. **301** (2): 182–204. doi:10.2475/ajs.301.2.182. Retrieved 2008-02-15.
57. van Gardingen, P.R.; Grace, J.; Jeffree, C.E.; Byari, S.H.; Miglietta, F.; Raschi, A.; Bettarini, I. (1997). "Long-term effects of enhanced CO_2 concentrations on leaf gas exchange: research opportunities using CO_2 springs". In Raschi, A.; Miglietta, F.; Tognetti, R.; van Gardingen, P.R. *Plant responses to elevated CO_2: Evidence from natural springs*. Cambridge: Cambridge University Press. pp. 69–86. ISBN 0-521-58203-2.
58. Martini, M. (1997). "CO_2 emissions in volcanic areas: case histories and hazards". In Raschi, A.; Miglietta, F.; Tognetti, R.; van Gardingen, P.R. *Plant responses to elevated CO_2: Evidence from natural springs*. Cambridge: Cambridge University Press. pp. 69–86. ISBN 0-521-58203-2.
59. Doney, Scott C.; Naomi M. Levine (2006-11-29). "How Long Can the Ocean Slow Global Warming?". Oceanus. Retrieved 2007-11-21.
60. Nienhuis, S.; Palmer, A.; Harley, C. (2010). "Elevated CO_2 affects shell dissolution rate but not calcification rate in a marine snail". *Proceedings of the Royal Society B: Biological Sciences*. **277** (1693): 2553–2558. doi:10.1098/rspb.2010.0206. PMC 2894921. PMID 20392726.
61. Gattuso, J.-P.; Frankignoulle, M.; Bourge, I.; Romaine, S. & Buddemeier, R. W. (1998). "Effect of calcium carbonate saturation of seawater on coral calcification". *Global and Planetary Change*. **18** (1–2): 37–46. Bibcode:1998GPC....18...37G. doi:10.1016/S0921-8181(98)00035-6.
62. Gattuso, J.-P.; Allemand, D.; Frankignoulle, M (1999). "Photosynthesis and calcification at cellular, organismal and community levels in coral reefs: a review on interactions and control by carbonate chemistry". *American Zoologist*. **39**: 160–183. doi:10.1093/icb/39.1.160.
63. Langdon, C; Atkinson, M. J. (2005). "Effect of elevated pCO_2 on photosynthesis and calcification of corals and interactions with seasonal change in temperature/irradiance and nutrient enrichment". *Journal of Geophysical Research*. **110** (C09S07): C09S07. Bibcode:2005JGRC..11009S07L. doi:10.1029/2004JC002576.
64. Riebesell, Ulf; Zondervan, Ingrid; Rost, Björn; Tortell, Philippe D.; Zeebe, Richard E. & François M. M. Morel (2000). "Reduced calcification of marine plankton in response to increased atmospheric CO_2". *Nature*. **407** (6802): 364–367. doi:10.1038/35030078. PMID 11014189.
65. Zondervan, I.; Zeebe, R.E.; Rost, B.; Rieblesell, U. (2001). "Decreasing marine biogenic calcification: a negative feedback on rising atmospheric CO_2". *Global Biogeochemical Cycles*. **15** (2): 507–516. Bibcode:2001GBioC..15..507Z. doi:10.1029/2000GB001321.
66. Zondervan, I.; Rost, B.; Rieblesell, U. (2002). "Effect of CO_2 concentration on the PIC/POC ratio in the coccolithophore *Emiliania huxleyi* grown under light limiting conditions and different day lengths". *Journal of Experimental Marine Biology and Ecology*. **272** (1): 55–70. doi:10.1016/S0022-0981(02)00037-0.
67. Delille, B.; Harlay, J.; Zondervan, I.; Jacquet, S.; Chou, L.; Wollast, R.; Bellerby, R.G.J.; Frankignoulle, M.; Borges, A.V.; Riebesell, U.; Gattuso, J.-P. (2005). "Response of primary production and calcification to changes of pCO_2 during experimental blooms of the coccolithophorid *Emiliania huxleyi*". *Global Biogeochemical Cycles*. **19** (2): GB2023. Bibcode:2005GBioC..19.2023D. doi:10.1029/2004GB002318.
68. Kuffner, I.B.; Andersson, A.J.; Jokiel, P.L.; Rodgers, K.S.; Mackenzie, F.T. (2007). "Decreased abundance of crustose coralline algae due to ocean acidification". *Nature Geoscience*. **1** (2): 114–117. Bibcode:2008NatGe...1..114K. doi:10.1038/ngeo100.
69. Phillips, Graham; Chris Branagan (2007-09-13). "Ocean Acidification – The BIG global warming story". *ABC TV Science: Catalyst*. Australian Broadcasting Corporation. Retrieved 2007-09-18.
70. Gazeau, F.; Quiblier, C.; Jansen, J. M.; Gattuso, J.-P.; Middelburg, J. J. & Heip, C. H. R. (2007). "Impact of elevated CO_2 on shellfish calcification". *Geophysical Research Letters*. **34** (7): L07603. Bibcode:2007GeoRL..3407603G. doi:10.1029/2006GL028554.
71. Comeau, C.; Gorsky, G.; Jeffree, R.; Teyssié, J.-L.; Gattuso, J.-P. (2009). "Impact of ocean acidification on a key Arctic pelagic mollusc ("Limacina helicina")". *Biogeosciences*. **6** (9): 1877–1882. doi:10.5194/bg-6-1877-2009.

72. Duana, Zhenhao; Rui Sun (2003). "An improved model calculating CO_2 solubility in pure water and aqueous NaCl solutions from 273 to 533 K and from 0 to 2000 bar". *Chemical Geology*. **193** (3–4): 257–271. doi:10.1016/S0009-2541(02)00263-2.
73. Cai, W. -J.; Chen, L.; Chen, B.; Gao, Z.; Lee, S. H.; Chen, J.; Pierrot, D.; Sullivan, K.; et al. (2010). "Decrease in the CO2 Uptake Capacity in an Ice-Free Arctic Ocean Basin". *Science*. **329** (5991): 556–559. Bibcode:2010Sci...329..556C. doi:10.1126/science.1189338. PMID 20651119.
74. Garrison, Tom (2004). *Oceanography: An Invitation to Marine Science*. Thomson Brooks. p. 125. ISBN 0-534-40887-7.
75. Ries, J. B.; Cohen, A. L.; McCorkle, D. C. (2009). "Marine calcifiers exhibit mixed responses to CO_2-induced ocean acidification". *Geology*. **37** (12): 1131–1134. Bibcode:2009Geo....37.1131R. doi:10.1130/G30210A.1.
76. Climate Change 2007: Synthesis Report (http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm), IPCC
77. "PMEL Ocean Acidification Home Page". Pmel.noaa.gov. Retrieved 2014-01-14.
78. Lupton, J.; Lilley, M.; Butterfield, D.; Evans, L.; Embley, R.; Olson, E.; Proskurowski, G.; Resing, J.; Roe, K.; Greene, R.; Lebon, G. (2004). "Liquid Carbon Dioxide Venting at the Champagne Hydrothermal Site, NW Eifuku Volcano, Mariana Arc". *American Geophysical Union*. Fall. Meeting (abstract #V43F–08): 8. Bibcode:2004AGUFM.V43F..08L.
79. Dhingra A, Portis AR, Daniell H (2004). "Enhanced translation of a chloroplast-expressed RbcS gene restores small subunit levels and photosynthesis in nuclear RbcS antisense plants". *Proc. Natl. Acad. Sci. U.S.A.* **101** (16): 6315–20. Bibcode:2004PNAS..101.6315D. doi:10.1073/pnas.0400981101. PMC 395966. PMID 15067115. "(Rubisco) is the most prevalent enzyme on this planet, accounting for 30–50% of total soluble protein in the chloroplast;"
80. Blom, T.J.; W.A. Straver; F.J. Ingratta; Shalin Khosla; Wayne Brown (December 2002). "Carbon Dioxide In Greenhouses". Retrieved 2007-06-12.
81. Ainsworth, Elizabeth A. (2008). "Rice production in a changing climate: a meta-analysis of responses to elevated carbon dioxide and elevated ozone concentration" (PDF). *Global Change Biology*. **14** (7): 1642–1650. doi:10.1111/j.1365-2486.2008.01594.x. Archived from the original (PDF) on 2011-07-19.
82. Long, SP; Ainsworth, EA; Leakey, AD; Nösberger, J; Ort, DR (2006). "Food for thought: lower-than-expected crop yield stimulation with rising CO_2 concentrations". *Science*. **312** (5782): 1918–21. Bibcode:2006Sci...312.1918L. doi:10.1126/science.1114722. PMID 16809532.
83. F. Woodward; C. Kelly (1995). "The influence of CO_2 concentration on stomatal density". *New Phytologist*. **131** (3): 311–327. doi:10.1111/j.1469-8137.1995.tb03067.x.
84. Bert G. Drake; Gonzalez-Meler, Miquel A.; Long, Steve P. (1997). "More efficient plants: A consequence of rising atmospheric CO_2?". *Annual Review of Plant Physiology and Plant Molecular Biology*. **48** (1): 609–639. doi:10.1146/annurev.arplant.48.1.609. PMID 15012276.
85. Loladze, I (2002). "Rising atmospheric CO_2 and human nutrition: toward globally imbalanced plant stoichiometry?". *Trends in Ecology & Evolution*. **17** (10): 457–461. doi:10.1016/S0169-5347(02)02587-9.
86. Carlos E. Coviella; John T. Trumble (1999). "Effects of Elevated Atmospheric Carbon Dioxide on Insect-Plant Interactions". *Conservation Biology*. **13** (4): 700–712. doi:10.1046/j.1523-1739.1999.98267.x. JSTOR 2641685.
87. Davey, M. P.; Harmens, H.; Ashenden, T. W.; Edwards, R.; Baxter, R. (2007). "Species-specific effects of elevated CO_2 on resource allocation in *Plantago maritima* and *Armeria maritima*". *Biochemical Systematics and Ecology*. **35** (3): 121–129. doi:10.1016/j.bse.2006.09.004.
88. Davey, M.; Bryant, D. N.; Cummins, I.; Ashenden, T. W.; Gates, P.; Baxter, R.; Edwards, R. (2004). "Effects of elevated CO_2 on the vasculature and phenolic secondary metabolism of *Plantago maritima*". *Phytochemistry*. **65** (15): 2197–2204. doi:10.1016/j.phytochem.2004.06.016. PMID 15587703.
89. "Global Environment Division Greenhouse Gas Assessment Handbook – A Practical Guidance Document for the Assessment of Project-level Greenhouse Gas Emissions". World Bank. Retrieved 2007-11-10.
90. Luyssaert, Sebastiaan; Schulze, E. -Detlef; Börner, Annett; Knohl, Alexander; Hessenmöller, Dominik; Law, Beverly E.; Ciais, Philippe; Grace, John (2008). "Old-growth forests as global carbon sinks". *Nature*. **455** (7210): 213–5. Bibcode:2008Natur.455..213L. doi:10.1038/nature07276. PMID 18784722.
91. Falkowski P, Scholes RJ, Boyle E, Canadell J, Canfield D, Elser J, Gruber N, Hibbard K, Högberg P, Linder S, Mackenzie FT, Moore B 3rd, Pedersen T, Rosenthal Y, Seitzinger S, Smetacek V, Steffen W (2000). "The global carbon cycle: a test of our knowledge of earth as a system". *Science*. **290** (5490): 291–296. Bibcode:2000Sci...290..291F. doi:10.1126/science.290.5490.291. PMID 11030643.
92. Friedman, Daniel. Toxicity of Carbon Dioxide Gas Exposure, CO_2 Poisoning Symptoms, Carbon Dioxide Exposure Limits, and Links to Toxic Gas Testing Procedures (http://www.inspect-ny.com/hazmat/CO2gashaz.htm). InspectAPedia
93. "CarbonTracker CT2011_oi (Graphical map of CO_2)". *esrl.noaa.gov*.
94. "Carbon Dioxide as a Fire Suppressant: Examining the Risks". U.S. Environmental Protection Agency:.
95. Volcano Under the City (http://www.pbs.org/wgbh/nova/transcripts/3215_volcanoc.html). PBS.org (1 November 2005).

96. Glatte Jr H. A.; Motsay G. J.; Welch B. E. (1967). "Carbon Dioxide Tolerance Studies". *Brooks AFB, TX School of Aerospace Medicine Technical Report*. SAM-TR-67-77. Retrieved 2008-05-02.
97. Lambertsen, C. J. (1971). "Carbon Dioxide Tolerance and Toxicity". *Environmental Biomedical Stress Data Center, Institute for Environmental Medicine, University of Pennsylvania Medical Center*. IFEM. Philadelphia, PA. Report No. 2-71. Retrieved 2008-05-02.
98. Satish U.; Mendell M. J.; Shekhar K.; Hotchi T.; Sullivan D.; Streufert S.; Fisk W.J. (2012). "Is CO_2 an Indoor Pollutant? Direct Effects of Low-to-Moderate CO_2 Concentrations on Human Decision-Making Performance" (PDF). *Environmental Health Perspectives*. **120** (12). doi:10.1289/ehp.1104789.
99. Joseph G. Allen; Piers MacNaughton; Usha Satish; Suresh Santanam; Jose Vallarino; John D. Spengler1Satish U. (2016). "Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments". *Environmental Health Perspectives*. **124** (6). doi:10.1289/ehp.1510037.
100. Bierwirth P. (2014). "How will rising carbon dioxide in the atmosphere directly affect human health via breathing toxicity? A Science Review" (PDF).
101. "Exposure Limits for Carbon Dioxide Gas – CO_2 Limits". InspectAPedia.com.
102. Law J.; Watkins S.; Alexander, D. (2010). "In-Flight Carbon Dioxide Exposures and Related Symptoms: Associations, Susceptibility and Operational Implications" (PDF). *NASA Technical Report*. TP–2010–216126. Retrieved 2014-08-26.
103. Schaefer K. E. (1979). "Effect of Prolonged Exposure to 0.5% CO_2 on Kidney Calcification and Ultrastructure of Lungs". *Undersea Biomed Res*. **S6**: 155–117. Retrieved 2014-10-19.
104. "How much carbon dioxide do humans contribute through breathing?". Archived from the original on 2011-02-02. Retrieved 2009-04-30.
105. Charles Henrickson (2005). *Chemistry*. Cliffs Notes. ISBN 0-7645-7419-1.
106. Derived from mmHg values using 0.133322 kPa/mmHg
107. Normal Reference Range Table (http://web.archive.org/web/20111225185659/http://pathcuric1.swmed.edu/pathdemo/nrrt.htm). University of Texas Southwestern Medical Center at Dallas. Used in Interactive Case Study Companion to Pathologic basis of disease.
108. "Carbon dioxide". solarnavigator.net. Retrieved 2007-10-12.

Further reading

- Seppanen, Fisk and Mendell, Association of Ventilation Rates and CO_2 Concentrations with Health and Other Responses in Commercial and Institutional Buildings, Indoor Air 1999.
- Shendell, Prill, Fisk, Apte1, Blake & Faulkner, Associations between classroom CO_2 concentrations and student attendance in Washington and Idaho, Indoor Air 2004.
- Soentgen, Jens, Hot air: The science and politics of CO2. In: Global Environment, Vol 7, March 2014, pp. 134–171.

External links

- International Chemical Safety Card 0021 (http://www.inchem.org/documents/icsc/icsc/eics0021.htm)
- CID 280 (https://pubchem.ncbi.nlm.nih.gov/compound/280) from PubChem
- Carbon dioxide MSDS (http://sdsdata.org/68399) by Amerigas in the SDSdata.org database.
- CDC – NIOSH Pocket Guide to Chemical Hazards – Carbon Dioxide (http://www.cdc.gov/niosh/npg/npgd0103.html)
- CO_2 Carbon Dioxide Properties, Uses, Applications (http://www.uigi.com/carbondioxide.html)
- Dry Ice information (http://www.dryiceinfo.com/science.htm)
- Trends in Atmospheric Carbon Dioxide (http://www.cmdl.noaa.gov/ccgg/trends/) *(NOAA)*
- "A War Gas That Saves Lives." (https://books.google.com/books?id=RicDAAAAMBAJ&pg=PA53) *Popular Science*, June 1942, pp. 53–57.
- NASA's Orbiting Carbon Observatory (http://oco.jpl.nasa.gov/)
- The on-line catalogue of CO_2 natural emissions in Italy (http://googas.ov.ingv.it/)
- Reactions, Thermochemistry, Uses, and Function of Carbon Dioxide (http://www.chemistry-reference.com/q_compounds.asp?CAS=124-38-9)

- Carbon Dioxide – Part One (http://www.periodicvideos.com/videos/mv_carbon_dioxide_one.htm) and Carbon Dioxide – Part Two (http://www.periodicvideos.com/videos/mv_carbon_dioxide_two.htm) at *The Periodic Table of Videos* (University of Nottingham)
- CO_2 emissions from fuel combustion (http://trendeconomy.com/en/industries/CO2_Emissions)

Retrieved from "https://en.wikipedia.org/w/index.php?title=Carbon_dioxide&oldid=737925306"

Categories: Acid anhydrides | Acidic oxides | Carbon dioxide | Coolants | Fire suppression agents | Greenhouse gases | Household chemicals | Inorganic solvents | Laser gain media | Nuclear reactor coolants | Oxocarbons | Propellants | Refrigerants | Gaseous signaling molecules

---

- This page was last modified on 5 September 2016, at 21:37.
- Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. By using this site, you agree to the Terms of Use and Privacy Policy. Wikipedia® is a registered trademark of the Wikimedia Foundation, Inc., a non-profit organization.

KING CITY
CALIFORNIA

Item No. 10 (B)

REPORT TO THE CITY COUNCIL

DATE: **SEPTEMBER 13, 2016**

TO: **HONORABLE MAYOR AND MEMBERS OF THE CITY COUNCIL**

FROM: **STEVEN ADAMS, CITY MANAGER**

RE: **CONSIDERATION OF RESOLUTION APPROVING A REVISED AND RESTATED FRANCHISE AGREEMENT WITH USA WASTE OF CALIFORNIA (DBA WASTE MANAGEMENT) FOR SOLID WASTE, RECYCLING AND ORGANICS COLLECTION SERVICES AND APPROVING NEW CUSTOMER RATES**

RECOMMENDATION:

It is recommended the City Council continue the public hearing to the September 27, 2016 meeting to provide additional time for review of the proposed rate increase submitted by Waste Management.

BACKGROUND:

The City's current franchise agreement for the subject services was originally approved in January 1996 and is due to expire at the end of the calendar year. Patrick Matthews, General Manager with Salinas Valley Recycles, has been tasked with representing the City in negotiating an extension of the agreement. At the April 28, 2015 meeting, City Council reviewed options and provided direction to Mr. Matthews.

DISCUSSION:

The public hearing was publicly noticed because negotiations have been completed and a draft new agreement has been prepared for Council consideration. However, at the time the agenda was finalized, Waste Management had not yet provided the documentation needed for staff to review and justify the rate increase requested. Therefore, staff has recommended the item be continued.

COST ANALYSIS:

The only cost impact of the continuance is that it delays the implementation of the proposed increase in the franchise fee.

ALTERNATIVES:

The following alternatives have been identified for City Council consideration:

1. Continue the public hearing to the September 27, 2016 meeting;
2. Continue the item to a date uncertain to provide additional time if there are specific issues the City Council would like addressed;
3. Open the public hearing, allow discussion, and then continue the item; or
4. Provide staff other direction.

Prepared and Approved by: _____
Steven Adams, City Manager

KING CITY
CALIFORNIA

Item No. **10 (C)**

REPORT TO THE CITY COUNCIL

DATE: **SEPTEMBER 13, 2016**

TO: **HONORABLE MAYOR AND MEMBERS OF THE CITY COUNCIL**

FROM: **STEVEN ADAMS, CITY MANAGER**

RE: **CONSIDERATION OF INTRODUCTION AND FIRST READING OF AN ORDINANCE TO REPEAL AND RE-ENACT CHAPTER 12 OF THE KING CITY MUNICIPAL CODE AND THEREBY ADOPT THE 2016 CALIFORNIA CODE OF REGULATIONS TITLE 24 WITH LOCAL ADMINISTRATIVE AMENDMENTS**

RECOMMENDATION:

It is recommended that the City Council introduce the Ordinance, conduct a public hearing and first reading of the Ordinance by title only, and schedule the second reading and adoption for the next regular City Council meeting.

BACKGROUND:

California State Law requires local jurisdictions to adopt the California Building Standards Code for local enforcement within 180 days of its adoption and publishing by the State. This Ordinance is to take effect on January 1, 2017.

DISCUSSION:

Attached is a draft Ordinance that would repeal and re-enact chapter 12 of the King City Municipal Code with local administrative amendments that were included in the previously adopted Ordinance. The new Code includes a long list of modifications. Some of the most significant Code changes include the following:

<u>California Building Code</u>

- Ground Fault protection is now required for residential dishwashers.
- New requirement for kitchen small appliance circuits and laundry area receptacles to be arc fault protected.

- All garages are now required to have a dedicated receptacle circuit.
- Balconies, decks, and porches are now required to have at least one receptacle.
- New attached garages to have conduit and box installed at construction for future 240V circuit for electric vehicle charging (required as of January 1, 2016 as a mid-cycle code change).
- New single-family residences to be solar ready with (2) 30 amp circuits terminated in attic (required as of January 1, 2016 as a mid-cycle code change).

California Plumbing Code

- Domestic hot water piping to be insulated (required as of January 1, 2016 as a mid-cycle code change).
- As of January 1, 2014, all residential buildings undergoing permitted alterations shall replace non-compliant plumbing fixtures with water conserving plumbing fixtures. California Civil Code 1101.4.
- On or before January 1, 2017, non-compliant plumbing fixtures in any single-family residential real property shall be replaced by the property owner with water-conserving plumbing fixtures.
- On and after January 1, 2017, a seller transferor of single-family residential real property shall disclose in writing to the prospective purchaser or transferee the requirements of subdivision (b) and whether the real property includes any noncompliant plumbing fixtures. (California Civil Code 1101.4

California Residential Code

- Adds the term townhouses and efficiency dwelling units to the definition of residential.
- Limits the definition to not more than 3 stories above grade plane in height.
- Gives discretion to the building official to determine if work to substantially improve/damaged building equals or exceeds 50 percent.
- Provides new design tables for wind & seismic designing.
- Changes in the minimum room area and ceiling heights.
- Changes to the requirements for glazing around adjacent doors, wet surfaces, and adjacent to the bottom stair landing. (R308.4.2).
- Changes in requirements for window & sills located less than 24" above the finished floor and more than 72" above the finished grade.

- Changes in the minimum percentage of recycle/salvage from 50% to 65% for non-hazardous construction waste.

California Energy Code

See the attached overview of the California Energy Code.

COST ANALYSIS:

There is no direct cost impact to the City from taking this action.

ALTERNATIVES:

The following alternatives have been identified for City Council consideration:

1. Approve staff's recommendation;
2. The City Council may chose not to adopt the new building codes, in which case the State Building Code as adopted by the State of California will become regulation in the City without the benefit of any local administrative amendments and with enforcement issues related to the lack of local regulations; or
3. Provide staff other direction.

Exhibits:

1. California Energy Code Fact Sheet

Submitted by: Paul Hodges CBO
Paul Hodges, Chief Building Official

Approved by:
Steven Adams, City Manager

ORDINANCE No. 2016-732

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF KING TO REPEAL AND RE-ENACT CHAPTER-12 (BUILDINGS AND CONSTRUCTION) OF THE CITY OF KING MUNICIPAL CODE PUT INTO PLACE BY ORDINANCE 2011-695, AND AMENDING THOSE PORTIONS OF THE CALIFORNIA CODE OF REGULATIONS TITLE 24 AS IDENTIFIED HEREIN: THIS ORDINANCE SHALL TAKE EFFECT ON JANUARY 1ST, 2017.

WHEREAS, the State of California from time to time adopts new California Building Standards Code title 24 and it had done so recently with the new Code becoming effective on January 1st 2017; and

WHEREAS, cities in order to maintain local control over the building standard and to adopt regulation specific to the city's geographical or topographical conditions, need to amend their own municipal codes prior to the January 1st, 2017 deadline; and

WHEREAS, the City Council of the City of King City desires to repeal and re-enact Chapter -12 (Building and construction) of the City of king Municipal Code put into place by Ordinance 2011-695; and

WHEREAS, the City Council of the City of King further wishes to amend those portions of the California Code of Regulations Title 24 as identified herein;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF KING, CALIFORNIA AS FOLLOWS:

SECTION 1: King City Municipal code is hereby amended delete Chapter 12 in its entirety and replace it with the following:

Chapter 12.04 Construction Codes Adopted:

Purpose and Authority- The purpose of this ordinance is to adopt by reference the 2016 edition of the California Building Standards Code Title 24 identified herein, and the 2015 edition of the International Property Maintenance Code subject to the definitions, clarifications, and the amendments set forth in this Ordinance. The purpose of this Ordinance is also to provide minimum requirements and standards for the protection of the public safety, health, property, and general welfare of the City of King City. This ordinance is adopted under the authority of Government Code Subsection 50022.2 and Health and Safety Code Section 18941.5

California Building Standards Title 24
PART 1---California Administrative Code
PART 2---California Building Code Volume 1 & 2 including listed Appendix chapters.
PART 2.5-California Residential Code including listed Appendix chapters.
PART 3---California Electrical Code including listed Appendix chapters.

PART 4---California Mechanical Code including the Appendix chapters.
PART 5---California Plumbing Code including listed Appendix chapters.
PART 6---California Energy Code including the listed Appendix chapters.
PART 8---California Historical Building Code including listed Appendix chapters.
PART 9---California Fire Code including the listed Appendix chapters.
PART 10- California Existing Building Code including listed Appendix Chapters
PART 11-California Green Building Standards Code.
PART 12-California Referenced Standards Code including listed Appendix chapter.

12.04.10 EXEMPTIONS FOR PENDING APPLICATIONS:

This Chapter shall be known as the City of King City Building Code, and may be cited as such, and will be referred to herein as "this Code"

(a) The provisions of the codes as adopted and amended herein, shall not apply to any building or structure for which application for a building permit was made prior to January 1, 2017. Such buildings or structure shall be erected, constructed, enlarged, altered or repaired in accordance with the provisions of this chapter in effect at the date of said application.
(b) All permit applications made after January 1, 2017 shall be processed in accordance with the provisions of the codes as adopted and amended herein.

12.04.020 DEFINITIONS:

"Building Code" means the California Building Code, or CBC 2016 edition, promulgated by the International Code Council including the appendix thereto, together with those omissions, exceptions and additions thereto as amended in Title 24 of the California Code of Regulations and this title.

"Residential Code" means the California Residential Code, or CRC2016 edition based on the International Residential Code, including the appendix thereto, together with those omissions, amendments, exceptions and additions thereto as amended in Title 24 of the California Code of Regulations and this title.

"Building Official" means the Chief Building Official, or a regularly authorized deputy.

"Existing Building" is a building legally erected prior to January 1, 2016.

"Fire Code" means the California Fire Code, or CFC as adopted and amended by the Monterey County Fire Department.

"Mechanical Code" is the California Mechanical Code or CMC 2016 based on the 2015 Uniform Mechanical Code including the appendix thereto, together with those omissions, amendments, exceptions and additions thereto as amended in Title 24 of the California Code of Regulations and this title.

"Occupancy" is the purpose for which a building, or part thereof, is used or intended to be used.

"Permit" is an official document or certificate issued by the Building Official authorizing performance of a specified building, plumbing, mechanical, or electrical activity or any combination of such permits issued jointly by the Building Official.

"Plumbing Code" is the California Plumbing Code or CPC based on the 2015 Uniform Plumbing Code including the appendix thereto, together with those omissions, amendments, exceptions and additions thereto as amended in Title 24 of the California Code of Regulations and this title.

"Structure" is that which is built or constructed, an edifice or building of any kind, or any work artificially built up or composed of parts joined together in some definite manner.

"Green Building Code" is the California Green Building Standards Code 2016 promulgated by the International Code Council and as adopted in Title 24 of the California Code of Regulations and this title.

"Technical Codes" refer to those codes adopted by this Chapter containing the provisions for design and maintenance of buildings and structures and building service equipment as herein defined which include but are not limited to the California Building Code, California Plumbing Code, California Mechanical Code, California Electrical Code, California Administrative Code, California Fire Code, California Historical Building Code the International Property Maintenance Code 2015. (Ord 636 2(part) 2002

12.04.0.30- ABOVE GROUND STORAGE

Notwithstanding anything to the contrary contained in this chapter or in the Fire Code, above-ground storage of Class 1, Class 2, or Class3, liquids at any location within the city is prohibited, except where such storage is in areas of the city with an M zoning designation or the storage is within a building and is specifically allowed under the provisions of Section 307.1.3, 307.1.4, or 307.1.5 of this chapter, provided that this prohibition shall not apply to any above-ground storage tank which was installed on a premises prior to the effective date of this ordinance, and which has remained in continuous and uninterrupted use since its installation. Above-ground storage tank installations in eligible areas must meet the following conditions:

(1) No more than one thousand gallons aggregate on site unless approved by the fire chief.
(2) Setbacks from buildings must meet the provisions of the Fire Code.
(3) Must be at least seventy-five feet away from property line.
(4) Must be approved for installation and use by all appropriate and applicable regulatory agencies.
(5) Must meet other safety installation requirements as determined by the Fire Chief. (Ord. 636 part2 (part) 2002)

12.04.040-HISTORIC BUILDINGS

Repairs, alterations and additions necessary for the preservation, restoration, rehabilitation or continued use of a building, structure or its building service equipment may be made without conforming to the requirements of the technical codes and in

accordance with the provisions of the 2015 California Historical Building Code when authorized by the building official, provided.

(1) The building or structure has been designated by official action of the legally constituted authority of the city as having special historical or architectural significance.
(2) Unsafe conditions as described in this title are corrected.
(3) The restored building or structure and its building service equipment will be no more hazardous based on life safety, fire safety, and sanitation than the existing building. (Ord.636 (2), (2002)

12.04.050-ADOPTION OF INTERNATIONAL AND UNIFORM CODES

The following publications are hereby adopted by reference and incorporated in this Code, except as expressly amended or superseded the provisions of this Chapter.

(a) California Administrative Code, 2016 Edition- specific to administrative regulations of/for the California Building Standards Commission (BSC), the Department of Housing and Community Development (HCD-2), the Office of the State Fire Marshal (SFM), the Division of the State Architect (DSA), the Office of Statewide Planning and Development (OSHPD), the Department of Health Services (DHS), the Occupational Safety and Health Standards Board (OSHA), the California Energy Commission (CEC) the Department of Food and Agriculture (AGR), the Department of Youth Authority (AU), et al.
(b) California Fire Code, 2016 Edition- based on the 2015 International Fire Code as published by the International Code Council) ICC) and as adopted and amended by the California Building Standards Commission in the California Building Standards Code, Title 24 of the California Code of Regulations, with amendments as adopted by Monterey County Fire.
(c) California Building Code, 2016 Edition- based on the 2015 International Building Code including, among the Appendices- Appendix Chapter C; (Group U-Agricultural Buildings), Appendix Chapter I; (Patio Covers), Appendix Chapter H; (signs) and Appendix Chapter J; (Grading) as modified, as published by the International Code Council (ICC) as adopted and amended by the California Building Standards Commission in the California Building Standards Code, Title 24 of the California Code of Regulations.
(d) California Electrical Code, 2016 Edition- based on the 2014 National Electrical Code as published by the National Fire Protection Association, as adopted by the California Building Standards Commission in Title 24 of the California Code of Regulations.
(e) California Mechanical Code, 2016 Edition- based on the 2014 Uniform Mechanical Code as published by the International Association of Plumbing and Mechanical Officials, and as amended and adopted by the California Building Standards Commission in Title 24 of the California Code of Regulations.
(f) California Plumbing Code, 2016 Edition- based on the 2015 Uniform Plumbing Code including among the appendices- Appendix Chapter A (Recommended Rules for Sizing the Water Supply System; Appendix Chapter B (Explanatory Notes on Combination Waste and Vent Systems); Appendix Chapter D (Sizing Storm Water Drainage Systems); Appendix Chapter I (Installation Standards); Appendix Chapter L (Alternative Plumbing Systems); as published by the International Association of Plumbing and Mechanical Officials, and as adopted

by the California Building Standards Commission in Title 24 of the California Code of Regulations.

(g) California Energy Code 2016 Edition including Appendices as adopted by the California Building Standards Commission in Title 24 of the California Code of Regulations.
(h) California Green Code, 2016 Edition as adopted by the California Standards Commission in Title 24 of the California Code of Regulations.
(i) California Referenced Standards Code 2016 Edition including Appendices as adopted by the California Building Standards Commission in Title 24 of the California Code of Regulations.
(j) International Property Maintenance Code, 2015 Edition published by the International Code Council.

12.040.070-CHANGE IN USE

Changes in the character or use of a building, or portion thereof, shall not be made except as specified in the Building Code. (Ord 636 2(part), 2002)

12.040.080-AMENDMENTS TO THE 2016 CALIFORNIA BUILDING CODES:

California Fire Code Part 9 2016: The 2015 edition published by the International Code Council and adopted and amended by the Office of the State Fire Marshall, including amendments as adopted by Monterey County Fire.

Chapter 1 Volume 1 General Code Provisions section 111 Office of the State Fire Marshal is hereby amended as follows;

(a) Amend Chapter 1 Part 1 section 101.1 to read as follows:
-Subsection 101.1 Title: These regulations shall be known as the Fire Code of the City of King hereinafter referred to as "this code"

(b) Amend Chapter 1 Part 2 Section 109.3 to read as follows:
Subsection 109.3 Violation penalties: Any person who shall violate a provision of this code or shall fail to comply with any of the requirements thereof or who shall erect, install, alter, repair, or do work in violation of the approved construction documents or directive of the fire code official, or of a permit or certificate used under provisions of this code, shall be guilty of a misdemeanor , punishable by a fine of not more than $1,000.00 dollars or by imprisonment not exceeding one year, or both such fine and imprisonment. Each day that a violation continues after due notice has been served shall be deemed a separate offense.

California Building Code part 2, 2016 Edition:

(a) Administration Chapter 1 volume 1 of the 2016 California Building Code, is hereby adopted and amended as follows:
(b) Subsection 103.1 Creation of enforcement agency, is amended to read as follows:
Subsection 103.1- The Building and Safety Department is hereby created and the official in charge thereof shall be known as the Building Official.

(c) Section 105 Permits is amended to read as follows:

Subsection 105.5 Expiration. Every Grading, Building, Fire, Plumbing, Mechanical, and electrical permit issued by the city under this code shall expire by limitation and become null and void two (2) years after the date of issuance (The maximum allowable length for all permits is 2 years (2), unless otherwise noted. Extensions will not normally be considered. Applicants with extenuating circumstances may submit written request and a filing fee to the Building Official. Such requests are required to outline extenuating circumstances that did not allow for the completion of the work as permitted). Or if the building or work authorized by such permit is not commenced within 180 days from the date of issuance, or if the building or work authorized by such permit is suspended or abandoned at any time after the work is commenced.

(d) Suspension and /or abandonment shall be determined by lack of progress inspections for a period of more than 180 days since a previous documented inspection. If a permit has expired, no work can recommence until a new permit is obtained.

Section 105.5.1- The cost of a new permit, the purpose of which is to facilitate completion of work for which a permit has expired, will be based on a quantitative estimation of inspections deemed necessary for completion. If costs for providing services to the project exceed the estimated fees collected at permit issuance, additional fees will apply. Said fees will be in accordance with the City's Building Department Fee Schedule established by resolution of the City Council. It is the responsibility of the permittee to schedule all inspections necessary for a permit to remain current and valid. All inspections for this purpose must verify progress.

Section 105.5.2- Permits may be issued for a limited period of time when deemed necessary by the Building Official to abate dangerous, substandard, and/or illegal conditions. In such cases, the Building Official will establish the expiration at 30, 60, 90, or 180 days depending on the health and/or safety hazards. Such permit team limitations may be shorter if deemed appropriate and/or necessary by the Building Official.

Section 109.2 Fees- Is hereby amended to read as follows:

Section 109.2.1 Building permit fees- All permit fees to include Building, Electrical, Mechanical, Plumbing, and Grading permit fees shall be in accordance with the schedule of fees adopted by resolution of the City Council of the City of King City from time to time.

Section 109.2.2 –Plan Review Fee- When a plan or other data are required to be submitted, a plan review fee shall be paid at the time of submitting plans and specifications for review. Plan review fees will be in addition to building permit fees for building, electrical, mechanical and plumbing work and shall be established by the City's Building Department Fee Schedule established by resolution of the City Council. The plan review fee for grading shall be in accordance with the schedule established by the City Council. Where plans are incomplete or changed so as to require additional plan review, an additional plan review fee shall be charged in accordance with the schedule established by the City Council for such fee.

Section 113- Board of Appeals – Is amended to read as follows:

The board of appeals established by Section 113 shall be the city council. Whenever any code adopted by reference establishes a board of appeals, that board shall be the City Council and the provisions of Sections 12.06.040 and 12.06.050 shall supersede the provisions of the adopted code.

Grading Appendix J Volume 11 of the 2016 California Building Code is hereby adopted and amended as follows:

Section J110 Erosion Control- is hereby amended to read as follows:

General—Building and access envelopes shall be delineated on the development plans when necessary to keep disturbance out of particularly erodible areas. Exposed soil shall be protected from erosion by temporary and/or permanent measures. Such protection may consist of mulching, plastic sheeting, and/or vegetation.

Runoff Control—where concentrated runoff will occur, it will be carried in pipe or culvert conduits or over a non-erodible surface (paved, rocked, or vegetated) to catchment basins clearly shown on the development plan. All conduits must have proper energy dissipaters at the point of discharge when necessary to prevent erosion.

Building Site Runoff—Runoff from the building site shall be controlled by berms, swales, ditches, structures, vegetative filter strips and/or catch-basins to prevent the escape of sediment from the site. At least one percent (1%) grade will be required toward an improved storm drainage or catch-basin facility, either existing or planned.

Runoff Retention—Permanent holding of runoff on the site through percolation to the ground shall be required during and after construction, by the use of catch-basin, retention grading, pavement collection and recharge systems, and/or individual systems for housing units such as drywells or cisterns.

Topsoil—to promote regrowth of vegetation, the topsoil shall be stockpiled and reapplied upon completion of grading on slopes of less than 5:1 (20%)

Soil Placement and Disposal—The placing or disposal of soil, silt or other organic and earthen materials from construction and other soil-disturbance activities at locations above the anticipated high water line of any stream in the basin where they may be washed into said waters by rainfall or runoff in quantities deleterious to fish, wildlife and other beneficial uses, is prohibited.

Temporary Vegetation—Temporary vegetation sufficient to stabilize the soil as permanent vegetation cover is maturing shall be established on all disturbed areas as needed and as each stage of grading is completed.

Winter Operation— (October 15 to April 15

(1) Land disturbance or development operations may be restricted or temporarily halted between October 15 and April 15 (the normal rainy season) and/or other times whenever the city Building inspector determines that the weather, soil, slope and general site conditions may cause serious accelerated erosion or sediment damage either on-site or downstream. When work is allowed, native ground cover shall not be cleared, destroyed, burned, or disturbed more than 15

days prior to grading or construction work unless approved in advance by the city building inspector.

(2) When land development work is allowed during the normal rainy season, adequate erosion and sediment control measures including sediment catch-basins must be in place and effective during any land disturbance.

(3) All cut and fill slopes without established vegetation between October 15 and April 15 shall be mulched. The mulching shall be anchored by punching or tacking into the soil or by the use of netting. A minimum of 1,000 pounds of straw, or equivalent, per each 10,000 square feet of slope surface will be required to be anchored. An additional amount may be required by the city building inspector.

(4) All erosion control plantings and mulching shall be closely monitored throughout the winter and runoff problems corrected promptly.

Dust—Dust from grading operations must be controlled. The permittee may be required to keep adequate equipment on the grading site to prevent dust problems.

Erosion Control Coordination with Project Installation.

(1) All vegetative and/or structural measures required to safely discharge any accelerated run-off generated by the project shall be installed during the first or initial construction phase of the project.

(2) Land shall be developed in increments of workable size which can be completed in a single construction season. Erosion and sediment control measures shall be coordinated with a sequence of grading, development and construction operations and all necessary erosion control measures shall be put in effect to the commencement of the next work increment and/or winter rainy season.

(3) Prior to completion and final acceptance of the project, all erosion control measures must be in place and all exposed base soil shall be mulched, fertilized and otherwise prepared so that it is planted to a permanent vegetative cover. The city building inspector may require watering of planted areas to initiate and assure growth.

Existing major Developments—as part of an expansion or intensification of existing major developments, silt and grease traps or sediment catch-basins shall be required.

Maintenance—all on-site erosion control facilities shall be properly maintained by the owners for the life of the project so that they do not become nuisances with stagnant water, heavy algae growth, insect breeding, odors, discarded debris, and/or safety hazards. Vegetative maintenance required may include mowing, fertilization, irrigation and/or reseeding.

California Electrical Code, 2016 Edition

(a) Article 89 – General Code Provisions of the 2016 California Electrical Code is here-by amended as follows:

(1) Subsection 89.108.4.2.1-All permit fees to include Building, Electrical, Mechanical, Plumbing, and grading permit fees shall be in accordance with the

schedule of fees adopted by resolution of the City Council of the city of King City from time to time.

Subsection 89.108.4.2.2 Plan Review Fee-When a plan or other data are required to be submitted, a plan review fee shall be paid at the time of submitting plans and specifications for review. Plan review fees will be in addition to building permit fees for building, electrical, mechanical and plumbing work and shall be established by the City's Building Department Fee Schedule established by resolution of the City Council. The plan review fee for grading shall be in accordance with the schedule established by the City Council. Where plans are incomplete or changed so as to require additional plan review, an additional plan review fee shall be charged in accordance with the schedule established by the City Council for such fee.

California Mechanical Code, 2016 Edition.

(a) Administration Chapter 1 of the 2016 California Mechanical Code, is here-by adopted and amended as follows:
(ii)Section 115.0 Fees- is hereby deleted and amended to read as follows:

(1) Subsection 115.1.0 Mechanical permit fee: All permit fees to include Building, Electrical, Mechanical, Plumbing, and Grading, permit fees shall be in accordance with the schedule of fees adopted by resolution of the City Council of the City of King City from time to time.

(2) Subsection 115.2 Plan Review Fee- When a plan or other data are required to be Submitted, a plan review fee shall be paid at the time of submitting plans and specifications for review. Plan review fees will be in addition to building permit fees for building, electrical, mechanical and plumbing work and shall be established by the City's Building Department Fee Schedule established by resolution of the City Council. Where plans are incomplete or changed so as to require additional plan review, an additional plan review fee shall be charged in accordance with the schedule established by the City Council for such fee.

California Plumbing Code, 2016 Edition

(a) Administration Chapter 1 of the 2016 California Plumbing Code, is here-by adopted and amended as follows:

(ii) Section 103.4 Fees- Is hereby deleted and amended to read as follows:

(1) Subsection 103.4.1: Plumbing Permit: All permit fees to include Building, Electrical, Mechanical, Plumbing and grading permit fees shall be in accordance with the schedule of fees adopted by resolution of the City Council of the City of King City from time to time.

(2) Subsection 103.4.2 Plan Review Fee- When a plan or other data are required to be submitted, a plan review fee shall be paid at the time of submitting plans and specification for review. Plan review fees will be in addition to building permit fees for Building, Electrical, Mechanical, Plumbing and Grading work and shall be established by the City's Building Department Fee Schedule established by resolution of the City Council. Where plans are incomplete or changed so as to

require additional plan review, an additional plan review fee shall be charged in accordance with the schedule established by the City Council for such fee.

International Property Maintenance Code, 2015 Edition

(A) Administration Chapter 1 Subsection 101.1 to read as follows:

Subsection 101.1 Title: These regulations shall be known as the International Property Maintenance Code of the City of King City, hereinafter referred to as "this code"

(B) Subsection 102.3 to read as follows:

Subsection 102.3 Application of other codes. Repairs, additions or alterations to a structure, or changes of occupancy, shall be done in accordance with the procedures and provisions of the California Building Standards Code and other applicable laws and ordinances.

(C) Subsection 103.5 to read as follows:

Subsection 103.5 Fees. The fees for activities and services performed by the code official under this code shall be in accordance with the Schedule of Fees adopted by resolution of the City Council of the City of King City from time to time.

(D) Subsection 111.2 to read as follows, and delete Sections 111.2.1 through 111.2.5.

Subsection 111.2 Membership of board of appeals. The board of appeals shall be the City Council, and shall be in accordance with Sections 12.06.040 and 12.06.050 of this code. (12.06.040 and 12.06.050 of this code)

(E) Subsection 112.4 to read as follows:

Subsection 112.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable to a fine of not less than $100 dollars or more than $1,000 dollars.

Chapter 12.06 Building Regulations- Administration and Enforcement

12.06.010: Enforcement Duty:

The Building Official of the city of King City is appointed and designated as the officer or employee having the duty to enforce the provisions of Chapter 12.04 of Title 12 of this code and the provisions of all of the Technical Codes adopted by reference by Chapter 12.04 of this code. (Ord 389 3 1977)

12.06.020: Powers of Arrest

The Building Official of the city shall have the right and power to arrest any person or persons who may violate the provisions of this code mentioned in Section 12.06.010 and any of the provisions of the Technical codes adopted by reference by Chapter 12.04 of this code. Ord. 389 3, 1977)

12.06.030: Penalty- A violation of any provision of this chapter or any of the construction codes adopted by reference herein shall constitute a misdemeanor. (Ord. 606 2, 1999)

12.06.040: Board of Appeals established

In order to hear and decide appeals of orders, decisions or determinations made by the building official relative to the application and interpretation of this code, there shall be established a board of appeals, consisting of the city council. The board shall adopt reasonable rules and regulations for conducting its investigations and shall render all decisions and findings in writing to the building official with a duplicate copy to the appellant.

12.06.050: Appeal Procedure

Any applicant for a permit aggrieved by a decision related to any matter within the purview of Chapters 12.04.010 through 12.08.070, shall have the right to appeal said decision. Such appeal shall be filed with the city clerk within ten days after notice of the decision has been mailed to such aggrieved person's last address, or has been communicated to him or his representative personally. Grounds for the appeal shall be set forth in writing. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply, or the requirements of this code are adequately satisfied by other means. The city council shall set the time and place for a hearing on such appeal and notice of such hearing shall be given to such person by mailing it to him, postage prepaid, at his last known address, at least five days prior to the date set for the hearing. The order of the city council on such appeal shall be final.

Chapter 12.08 Fire Prevention Requirements

12.08.010: Purpose

The purpose of this chapter is to prescribe regulations governing conditions hazardous to life and property from fire, hazardous materials or explosion. Notwithstanding any provisions contrary in the currently, adopted editions for the Fire Code, the Building Code, or any applicable code, automatic fire sprinkler systems as approved by the King City fire department shall be installed and maintained in certain buildings described herein. (Ord. 585 2Exh. A(part), 1995)

12.08.020: Fire Sprinkler Requirements for Commercial and Industrial Zones and Uses Fire Sprinkler Requirements for New Construction.

(A) All new buildings classified in the Building Code as a Group A-B-E-F-H-I-M-or S occupancies exceeding five thousand square feet, regardless of area separation walls, shall be protected by an automatic fire sprinkler

system. For the purpose of this section, contiguous buildings or structures such as shopping centers shall be considered as one building where internally linked by common walls.

(B) All existing buildings classified in the Building Code as a Group A-B-E-F-H-I-M or S occupancy where the floor area is increased and the resulting total floor area exceeds five thousand square feet, regardless of area separation walls, shall be protected with an automatic fire sprinkler system.

(C) All existing buildings exceeding five thousand square feet where an automatic fire sprinkler system does not exist, and a change in the character of occupancy or use is made which increases the fire hazard as per the Fire Code or the Building Code, shall be protected with an automatic fire sprinkler system.

(D) All required sprinkler systems shall be installed utilizing recognized standards or codes and shall be approved by the King City fire department. (Ord 585 2Exh. A (part), 1995)

12.08.030: Fire Sprinkler requirements for new construction in all residential zones and uses

An approved automatic fire-sprinkler system shall be installed in all newly constructed occupancies within any residential zone within the city, or occupancies moved into or relocated within any residential zone in the city. The system shall comply with NFPA standard 13, 13D, or 13R as determined by the Fire Chief.

Exceptions:

(1) Detached Group U Occupancies (as defined in the Fire Code).
(2) An automatic sprinkler system need not be provided when the floor area of a temporary building (as defined in the Fire Code) is less than one thousand square feet. (Ord. 624 1, 2001: Ord. 585 2Exh. A (part), 1995

12.08.040 Fire Resistive Roofs

(A) Fire Resistive Roofs: Notwithstanding any provisions to the contrary contained in the currently adopted editions of the Fire Code, the Building Code, or any applicable code, roofs shall be constructed of fire resistive materials:

(1) On all new buildings;
(2) On all existing buildings when it becomes necessary to replace more than fifty percent of the area of the roof.

(B) Wood Shake and Wood Shingle Roofing Materials: Wood shake and wood shingle roofing materials shall not be permitted unless listed as a Class A-rated roof covering. Treated wood shake and wood shingles which are certified as fire resistive for the expected life of the product may be used on roofs of additions to existing buildings which presently have wood shake or wood shingles, provided the roof area of the addition does not exceed fifty percent of the roof area of the existing building. If the roof area of the addition exceeds fifty percent of the existing building, the roof of the entire structure shall be permanently fire resistive. (Ord. 585 2Exh. A (part) 1995)

12.08.050 Change in use or occupancy

Should the use or occupancy of any building classified as a Group R-3 or U occupancy be changed, the provisions of this chapter shall apply. (Ord 585 2Exh. A (part), 1995)

12.08.060 Permit required

(A) Permits: Permits shall be required to be obtained from the King City Fire Department for all sprinkler systems required by this chapter and for all installations required by the currently adopted editions of the Building Code or Fire Code.

(B) Fire Extinguishers: All fire extinguishing systems shall be installed, and shall comply with the currently adopted edition of the Building Code and the most current edition of the National Fire Protection Association Standards. (Ord. 585 2 Exh. A(part), 1995)

SECTION 2: It is the intent of this ordinance to amend the King City Municipal Code. If the above amendment did not fully effectuate that intent, Council herby directs the City clerk to make any other such changes to the language in the King City Municipal Code as necessary to effectuate the intent of this Ordinance. Such changes shall be considered clerical.

SECTION 3: All ordinance and parts in conflict herewith are hereby repealed. This ordinance will become effective on January 1st, 2017.

This Ordinance was introduced and read by title only on the 13th day of September 2016 and was passed and adopted on this 27th day of September, 2016.

PASSED, ADOPTED AND APPROVED this 27th day of September 2016.

AYES:
NOES:
ABSENT
ABSTAIN:

Robert Cullen, Mayor

ATTEST:

_____
Steven Adams, City Clerk

APPROVED AS TO FORM:

_____
Martin Koczanowicz, City Attorney

2016 ENERGY CODE

Ace Resources

Title 24, Part 6

Fact Sheet

Residential

What's New with 2016 Code?

Overview

The 2016 update to the Residential Building Energy Efficiency Standards (Energy Standards) requires new and altered homes to become more efficient in several ways to create energy and environmental savings for Californians. See Figure 1 below for building systems that include updates under the new 2016 Energy Standards.

The 2016 Energy Standards have been adopted, and once approved, will be implemented for projects permitted on or after January 1, 2017. For more detailed information, see the related California Energy Commission (Energy Commission) FAQ sheet.

Figure 1: Title 24, Part 6 2016 Updates Highlighted by Energy Commission

Statewide Savings

The incremental changes to California's energy code mean big savings across the state for ratepayers. Per the Energy Commission, new residential requirements for the 2016 code cycle mean real savings for homeowners—around $7,400 over a 30 year mortgage. A single family home that meets the 2016 standards could see 28% more energy savings in regulated loads than those built under the 2013 Energy Standards. See the Adoption Hearing Presentation for more 2016 Energy Standards energy impacts.

California's Energy Goals

California's Energy Efficiency Strategic Plan describes energy efficiency as the "least cost, most reliable, and most environmentally sensitive resource, and minimizes our contribution to climate change."

The Strategic Plan goes on to outline four "Big Bold Strategies" to guide the market transformation necessary to meet the State's energy goals. A short description of the "Big Bold Strategies" and overview of the Strategic Plan is included in a summary Fact Sheet.

Energy codes and standards is one of six themes identified in the Energy Efficiency Strategic Plan to achieve the Big Bold Strategy related to residential construction. The Strategic Plan describes the role of codes and standards as:

"Adopt progressive and progressive minimum energy codes and standards for buildings and plug loads, effective code compliance and enforcement, and parallel, tiered voluntary energy efficiency standards that pull the market along and set a higher bar for subsequent standards."

The updates made to the Energy Standards described in this fact sheet are meant to take action on the codes and standards theme outlined in the Strategic Plan.

Envelope Highlights

Mandatory Measures §150.0

There are several new thresholds for mandatory envelope requirements including:

- Ceiling/Roof insulation maximum = 0.043 U-factor (R-22 wood framing)
- Non-framed (mass) wall maximum = 0.102 U-factor
  - Equivalency to R-13 wood framing
- Maximum fenestration U-factor = 0.58 (same as 2013)
  - New exception allows for 30 sqft for dual glazed greenhouse windows
- Doors (including pet doors) must meet maximum 0.3 cfm/ft² air leakage

Prescriptive High Performance Walls §150.1

In Climate Zones 1-5 & 8-16, above grade framed wall assemblies must not exceed a maximum U-factor of 0.051:

- 2x6 @ 16" OC framing—R19 cavity + R5 continuous
- 2x4 @ 16" OC framing—R15 cavity + R8 continuous

In Climate Zones 6 & 7, the maximum U-Factor is 0.065

Prescriptive High Performance Attics §150.1

There are three options that may be used to comply:

- **Option A:** Ducts and air handler may be located in the attic
  - Install attic radiant barrier (Zones 2-15)
  - Install R-38 insulation at ceiling (R-30 in zones 3 & 5-7)
  - Install continuous roof deck insulation (Zones 4 & 8-16)
    - R-6 with air space above insulation/ R-8 with no space
- **Option B:** Ducts and air handler may be located in the attic
  - Install attic radiant barrier (Zones 2,3 & 5-7)
  - Install R-38 insulation at ceiling (R-30 in Zones 3 & 5-7)
  - Install below roof deck insulation (at rafter) (Zones 4 & 8-16)
    - R-13 with air space above insulation/ R-18 with no space
- **Option C:** Ducts and air handler must be located in conditioned space
  - Install attic radiant barrier (Zones 2-15)
  - Install R-38 insulation at ceiling (R-30 in Zones 3 & 5-7)

Prescriptive Additions §150.2

There are several options that allow for extensions of existing
wood-framed walls to retain the same dimensions.

- Install R-15 in 2x4 framing
- Install R-19 in a 2x6 framing

Mechanical Highlights

Updates were made to both mandatory and prescriptive HVAC requirements under the 2016 Standards:

Mandatory Measures §150.0(m)

- All ducts in conditioned spaces must include R-4.2 insulation.
- Duct leakage requirement has been reduced to 5% maximum for single family homes.

Prescriptive Measures §150.1

- High performance attics with ducts in attic (options A and B)
  - R-8 duct insulation in Zones 1-2, 4, 8-16
  - R-6 duct insulation in Zones 3, and 5-7
- High performance attics with ducts in conditioned space (option C)
  - R-6 in all zones
- Whole house fans must supply 1.5 cfm/sf (reduced from 2 cfm/sf). Attic vent area also reduced to 1 sf/ 750 cfm of airflow.

Domestic Hot Water Highlights

Increased Prescriptive Efficiency for Water Heaters (3 options) §150.1(c)8

1. Tankless (gas or propane): minimum energy factor of 0.82
2. Tank ≤ 55 gal (gas or propane): minimum energy factor of 0.60. Additional HERS verification: HERS verified Quality Insulation Installation (QII) and either HERS verified compact hot water distribution system or HERS verified DHW pipe insulation required.
3. Tank > 55 gal (gas or propane): minimum energy factor of 0.76. Additional HERS verification: HERS verified compact hot water distribution system or HERS verified DHW pipe insulation required.

Mandatory Isolation Valves §110.3(c)7

- Instantaneous water heaters with an input rating of 6.8kBTU/hr (2 kW) or greater need an isolation valve on cold water supply and hot water leaving water heater.
- Each valve needs a hose bibb or other fitting allowing for flushing the water heater when the valves are closed.

Mandatory Water Heater Pipe Insulation §150.2(b)1G

- For water heater replacements, install piping insulation per mandatory requirements. Insulation for existing accessible piping must meet the requirements of Sections 150.0(j)2Ai, iii and iv.

Onsite Renewable Systems Highlights

The compliance credit for installing PV systems is only available if the project meets the following conditions:

- The Performance Approach is used
- The project is in Climate Zones 1-5, 8-16
- The system is ≥ 2 kWdc* for Single Family
- The system is ≥ 1 kWdc* for Multifamily
- The amount of credit will depend upon the Climate Zone and the Conditioned Floor Area of the dwelling.

Note: Taking the PV system credit does not require HERS verification unless getting a rebate from the New Solar Homes Partnership (NSHP).

Lighting Highlights

Mandatory High Efficacy Lighting §150.0(k)

High efficacy lighting is essential to reducing energy load in homes and dwelling units, and the 2016 Standards makes it mandatory that all residential lighting be high efficacy. The Standards do not allow trade-offs between lighting and other features when using the Performance Method.

These mandatory requirements apply to permanently installed light fixtures, including screw-based which must contain JA8 compliant lamps. Table 150.0-A summarized below, lists light source technologies qualified as high efficacy.

Table 150.0-A Non-Efficacy Light Sources
Pin-based linear or compact fluorescent lamps light sources using electronic ballasts
Pulse-start metal halide lamps
High pressure sodium lamps
GU-24 sockets containing light sources other than LEDs
Inseparable SSL luminaires that are installed outdoors
Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting

Light sources not listed in Table 150.0-A above may be certified to the Energy Commission as high efficacy in accordance with Joint Appendix 8 (JA8).

JA8 compliant light sources must be marked as "JA8-2016" or "JA8-2016-E." "JA8-2016-E" designates light sources that have passed the Elevated Temperature Life Test and are deemed appropriate for use in enclosed luminaires.

JA8 compliant light sources shown in the table below must be controlled by vacancy sensors or dimmers (exceptions for closets <70 SF and hallways, §150.0(k)2K).

Table 150.0-A JA8 High Efficacy Light Sources
Light sources in ceiling recessed downlight luminaires
LED luminaires with integral sources
Pin-based LED lamps (MR-16, AR-111, etc.)
GU-24 based LED light source

Screw Based Luminaires §150.0(k)G

- Screw based luminaires must contain JA8 compliant light sources.
- Recessed downlight luminaires in ceilings must not contain screw-based sockets.
- Incandescent sources are prohibited from having a GU-24 base (per Title 20 Section 1605.3(k).

Blank Electrical Boxes §150.0(k)B

- The number of blank electrical boxes more than 5 feet above the finished floor shall not be greater than the number of bedrooms.
- Additionally, these electrical boxes must be served by a dimmer, vacancy sensor, or fan speed control.

Bathrooms, Garages, Laundry Rooms, and Utility Rooms §150.0(k)2J

- At least one fixture must be controlled by a vacancy sensor.

Under Cabinet Lighting §150.0(k)2L

- Any under cabinet lighting (including kitchen) must be switched separately from other lighting systems.

Outdoor Lighting §150.0(k)3

- Must be high efficacy like indoor lighting.
- Must include manual on/off switch and one of the following:
  - Photocontrol and motion sensor
  - Photocontrol and automatic time switch control
  - Astronomical time switch control
  - Energy Management Control System

This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission. © 2016 Pacific Gas and Electric Company, San Diego Gas and Electric, Southern California Gas Company and Southern California Edison. All rights reserved, except that this document may be used, copied, and distributed without modification. Neither PG&E, Sempra, nor SCE — nor any of their employees makes any warranty, express of implied; or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any data, information, method, product, policy or process disclosed in this document; or represents that its use will not infringe any privately-owned rights including, but not limited to patents, trademarks or copyrights.