HEALTH RISK ASSESSMENT

COTT BEVERAGE FACILITY

CITY OF SAN BERNARDINO, CALIFORNIA

LSA

February 2012

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1.0 INTRODUCTION

1.1 INTRODUCTION

LSA Associates, Inc. (LSA) has completed a health risk assessment (HRA) for the proposed Cott Beverage Facility project located in the City of San Bernardino (City) in San Bernardino County, California.

An HRA is a process used to estimate the increased risk of health problems in people who are exposed to hazardous air pollutants (HAP). An HRA combines results of studies on the health effects of various animal and human exposures to HAP with results of studies that estimate the level of people's exposures at different distances from the sources of the pollutants. This HRA examines the short-term and long-term potential health effects from project-related emissions of HAP in the exhaust of diesel-powered delivery trucks on existing surrounding sensitive receptors, including single-family residences.

1.2 BACKGROUND

1.2.1 California Air Resources Board Handbook

The California Air Resources Board (ARB) has developed an Air Quality and Land Use Handbook[1] that is intended to serve as a general reference guide for evaluating and reducing air pollution impacts associated with new projects that are part of the land use decision-making process. According to the ARB Handbook, recent air pollution studies have shown an association between both respiratory and other noncancer health effects and proximity to high traffic roadways. Other studies have shown that diesel exhaust and other cancer-causing chemicals emitted from cars and trucks are responsible for much of the overall cancer risk from airborne toxics in California. The ARB Handbook recommends that planning agencies strongly consider proximity to these sources when finding new locations for "sensitive" land uses, such as homes, medical facilities, daycare centers, schools, and playgrounds.

1.3 PROJECT LOCATION

The project site is bounded to the west by Waterman Avenue; to the east by the existing Cott Beverage Facility; to the north by vacant land and existing commercial uses, with Mill Street further to the north; and to the south by existing industrial and commercial uses. Figure 1 illustrates the location of the project.

[1] California Air Resources Board, 2005. *Air Quality and Land Use Handbook: A Community Health Perspective.* April.

Figure 1: Project Location Map

1.4 PROJECT DESCRIPTION

The proposed project will be developed as an industrial warehouse building and is planned for a maximum of 346,084 square feet (sf) of building space, on a 14.46 acre (AC) lot. The project will be designed to obtain Leadership in Energy and Environmental Design (LEED) certification and will employ energy and water conservation measures in accordance with achieving such certification. There will be 50 dock doors provided and 56 trailer parking positions. Access to the site will be provided via three driveways on Waterman Avenue. Figure 2 illustrates an approved site plan for the project.

1.5 EXISTING SENSITIVE LAND USES IN THE PROJECT AREA

Sensitive receptors include residences, schools, hospitals, and similar uses that are sensitive to HAP. Land uses immediately adjacent to the project site are largely vacant. The closest existing residential uses are approximately 50 feet (ft) from the project's southern boundary and 250 ft from the existing onsite structures. There are residential uses to the east approximately 400 ft from the project site. To the west of Waterman Avenue, there is a mix of commercial and other industrial uses. The City's Housing Authority has an office to the southwest of the site across Waterman Avenue.

Figure 2: Proposed Site Plan

2.0 SETTING

2.1 REGIONAL AIR QUALITY

The project site is located in the City of San Bernardino, California, which is part of the South Coast Air Basin (Basin) and is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The health risk assessment for the proposed project includes estimating emissions associated with long-term operation of the proposed project.

2.1.1 Climate/Meteorology

Air quality in the planning area is not only affected by various emission sources (mobile, industry, etc.), but also by atmospheric conditions such as wind speed, wind direction, temperature, rainfall, etc. The combination of topography, low mixing height, abundant sunshine, and emissions from the second largest urban area in the United States gives the Basin the worst air pollution problem in the nation.

The annual average temperature varies little throughout the Basin, ranging from the low to middle 60s, measured in degrees Fahrenheit (°F). With a more pronounced oceanic influence, coastal areas show less variability in annual minimum and maximum temperatures than inland areas. The climatological station closest to the site is the San Bernardino station.[1] The monthly average maximum temperature recorded at this station in the past ranged from 66.2°F in January to 96.2°F in July and August, with an annual average maximum of 79.9°F. The monthly average minimum temperature recorded at this station ranged from 38.5°F in January to 59.4°F in August, with an annual average minimum of 48.2°F. January is typically the coldest month, and August is typically the warmest month in this area of the Basin.

The majority of annual rainfall in the Basin occurs between November and April. Summer rainfall is minimal and is generally limited to scattered thundershowers in coastal regions and slightly heavier showers in the eastern portion of the Basin and along the coastal side of the mountains. The San Bernardino station monitored precipitation from 1893 to 2004 and is still representative of the area precipitation. Average monthly rainfall measured during that period varied from 3.25 inches in February to 0.71 inch or less between May and October, with an annual total of 16.12 inches. Patterns in monthly and yearly rainfall totals are unpredictable due to fluctuations in the weather.

The Basin experiences a persistent temperature inversion (increasing temperature with increasing altitude) as a result of the Pacific high. This inversion limits the vertical dispersion of air contaminants, holding them relatively near the ground. As the sun warms the ground and the lower air layer, the temperature of the lower air layer approaches the temperature of the base of the inversion (upper) layer until the inversion layer finally breaks, allowing vertical mixing with the lower layer.

[1] Western Regional Climate Center, www.wrcc.dri.edu.

This phenomenon is observed in mid-afternoon to late afternoon on hot summer days, when the smog appears to clear up suddenly. Winter inversions frequently break by midmorning.

Winds in the vicinity of the project area blow predominantly from the south-southwest, with relatively low velocities. Wind speeds in the project area average about 4 miles per hour (mph). Summer wind speeds average slightly higher than winter wind speeds. Low average wind speeds, together with a persistent temperature inversion limit the vertical dispersion of air pollutants throughout the Basin. Strong, dry, north or northeasterly winds, known as Santa Ana winds, occur during the fall and winter months, dispersing air contaminants. The Santa Ana conditions tend to last for several days at a time.

The combination of stagnant wind conditions and low inversions produces the greatest pollutant concentrations. On days of no inversion or high wind speeds, ambient air pollutant concentrations are the lowest. During periods of low inversions and low wind speeds, air pollutants generated in urbanized areas are transported predominantly on shore into Riverside and San Bernardino Counties. In the winter, the greatest pollution problems are CO and oxides of nitrogen (NO_X) because of extremely low inversions and air stagnation during the night and early morning hours. In the summer, the longer daylight hours and the brighter sunshine combine to cause a reaction between hydrocarbons and NO_X to form photochemical smog.

2.1.2 Hazardous Air Pollutants

The public's exposure to HAPs is a significant environmental health issue in the State of California (State). In 1983, the California Legislature enacted a program to identify the health effects of HAPs and to reduce exposure to these contaminants to protect the public health. The Health and Safety Code defines a HAP as “an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health.” A substance that is listed as a hazardous air pollutant pursuant to subsection (b) of Section 112 of the Federal Act (42 United States Code [USC] Sec. 7412[b]) is a toxic air contaminant. Under State law, the California Environmental Protection Agency (CalEPA), acting through the ARB, is authorized to identify a substance as a HAP if it determines the substance is an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health.

California regulates HAPs primarily through Assembly Bill (AB) 1807 (Tanner Air Toxics Act) and AB 2588 (Air Toxics “Hot Spot” Information and Assessment Act of 1987). The Tanner Air Toxics Act sets forth a formal procedure for ARB to designate substances as HAPs. Once a HAP is identified, ARB adopts an “airborne toxics control measure” for sources that emit designated HAPs. If there is a safe threshold for a substance at which there is no toxic effect, the control measure must reduce exposure to below that threshold. If there is no safe threshold, the measure must incorporate toxics best available control technology (T-BACT) to minimize emissions.

Air toxics from stationary sources are also regulated in California under the Air Toxics “Hot Spot” Information and Assessment Act of 1987. Under AB 2588, toxic air contaminant emissions from individual facilities are quantified and prioritized by the air quality management district or air pollution control district. High priority facilities are required to perform a health risk assessment and,

if specific thresholds are exceeded, required to communicate the results to the public in the form of notices and public meetings.

To date the ARB has designated nearly 200 compounds as HAPs. Additionally, the ARB has implemented control measures for a number of compounds that pose high risks and show potential for effective control. The majority of the estimated health risks from HAPs can be attributed to a relatively few compounds, the most important being particulate matter from diesel-fueled engines (DPM).

3.0 THRESHOLDS

3.1 HEALTH RISK ASSESSMENT THRESHOLDS OF SIGNIFICANCE

Both the State and the federal government have established health-based ambient air quality standards (AAQS) for seven air pollutants. For other air pollutants without defined significance standards, the definition of substantial pollutant concentrations varies. For HAPs, "substantial" is taken to mean that the individual cancer risk exceeds a threshold considered to be a prudent risk management level. If T-BACT has been applied, the individual cancer risk to the maximum exposed individual (MEI) must not exceed 10 in 1 million in order for an impact to be determined not to be significant.

Airborne impacts are also derived from materials considered to be a nuisance for which there may not be associated standards. Odors or the deposition of large diameter dust particles outside the particulate matter less than 10 microns in diameter (PM_{10}) size range would be included in this category.

The following limits for maximum individual cancer risk (MICR), and noncancer acute and chronic hazard index (HI) from project emissions of HAPs are considered appropriate for use in determining the health risk for projects in the Basin:

- **MICR:** MICR is the estimated probability of an MEI contracting cancer as a result of exposure to HAPs over a period of 70 years for residential locations. The MICR calculations include multipathway consideration, when applicable.

  The cumulative increase in MICR that is the sum of the calculated MICR values for all HAPs emitted from the project would be considered significant if it would result in an increased MICR greater than 10 in 1 million (1.0×10^{-5}) at any sensitive receptor location.

- **Chronic HI:** Chronic HI is the ratio of the estimated long-term level of exposure to a HAP for a potential MEI to its chronic reference exposure level. The chronic HI calculations include multipathway consideration, when applicable.

  The project would be considered significant if the cumulative increase in total chronic HI for any target organ system due to total emissions from the project would exceed 1.0 at any receptor location.

- **Acute HI:** Acute HI is the ratio of the estimated maximum 1-hour concentration of a HAP for a potential MEI to its acute reference exposure level.

  The project would be considered significant if the cumulative increase in total acute HI for any target organ system due to total emissions from the project would exceed 1.0 at any receptor location.

4.0 IMPACTS AND MITIGATION

4.1 HEALTH RISK ASSESSMENT

Hazardous air pollution emissions associated with the project would occur from a variety of activities related to the project operations. The only significant amount of HAP known to be released from the proposed distribution facility is contained in the exhaust of project-related vehicles. While there may be other toxic air pollutants in use on site, compliance with City, SCAQMD, State, and federal handling regulations will keep those emissions below a level of significance. For the purposes of an HRA, short-term emissions are of concern for analyzing acute health impacts, and long-term emissions are of concern for analyzing chronic and carcinogenic health impacts.

A screening-level single pathway assessment has been conducted, analyzing the inhalation pathway. This technique was chosen as recommended in the Office of Environmental Health and Hazards Assessment (OEHHA) Air Toxic Hot Spots Program Risk Assessment Guidelines (August 2003), Appendix D, "Risk Assessment Procedures to Evaluate Particulate Emissions from Diesel-Fueled Vehicles." For risk assessment procedures, the OEHHA specifies that the surrogate for whole diesel exhaust is DPM.

The OEHHA has determined that long-term exposure to diesel exhaust particulates poses the highest cancer risk of any HAP it has evaluated. Exposure to diesel exhaust can also have immediate health effects. Diesel exhaust can irritate the eyes, nose, throat, and lungs, and it can cause coughs, headaches, lightheadedness, and nausea. In studies with human volunteers, diesel exhaust particles made people with allergies more susceptible to the materials to which they are allergic, such as dust and pollen. Exposure to diesel exhaust also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks.

Fortunately, improvements to diesel fuel and diesel engines have already reduced emissions of some of the contaminants. These improvements have already resulted in a 75 percent reduction in particle emissions from diesel-powered trucks and other equipment (as compared to 2000 levels), and by 2020, when fully implemented, they will result in an 85 percent reduction.[1] These improvements are anticipated to continue into the foreseeable future. However, to be conservative, other than what is built into the EMFAC2007 model, none of these anticipated improvements are included in this HRA.

The first step of the HRA is to characterize the project-related vehicle emissions. The project Traffic Impact Study performed by LSA Associates, Inc. (February 2012) only lists total daily trips by automobiles and trucks. In order to determine how many of the total project-related daily trips are attributed to diesel trucks, the total project average daily trips of 498 is first broken down into four categories using the data in a study performed by the City of Fontana to characterize vehicle usage in warehouse-type of projects. This study is widely used as a reference for traffic analyses of industrial warehouse land use projects. The Fontana study found that for a warehouse similar to this project, the

[1] Cal EPA OEHHA and American Lung Association of California, 2002. *Health Effects of Diesel Exhaust*. April.

percentage of each vehicle type is: 79.6 percent automobiles, 3.5 percent two-axle trucks, 4.6 percent three-axle trucks, and 12.3 percent four-plus-axle trucks. So, for a total project average daily trips of 498, the daily project-related vehicle trips will be 396 automobiles, 17 two-axle trucks, 23 three-axle trucks, and 61 four-plus-axle trucks Even though these trucks will probably be of various sizes, for this HRA it was assumed that these trucks were all the type of truck that resulted in the greatest exhaust emissions and highest health risk levels.

These trucks operate in two modes: stationary idling and moving on and off the site. The emissions from the trucks while idling result in much higher concentrations of HAP at nearby sensitive receptors than the emissions from the trucks while moving, because while moving, the distance the truck is from the receptors is changing and the motion of the truck tends to disperse the exhaust. For this screening level assessment, the moving emissions were modeled as a series of volume sources along roadways and the idling emissions as individual volume sources at idling locations. The idling times of the trucks were conservatively assumed to be double the State and federal regulations of no more than 5 minutes per stop.

Trucks are assumed to operate 24 hours per day and 7 days per week. Based on the site plan, idling locations were modeled adjacent to the buildings at the loading dock areas. An approximate representation of the roadway was obtained by placing a number of volume sources at equal intervals along the roads on site and far enough off site to characterize the emissions at the sensitive receptors near the project site. For other sensitive receptors further from the project site but near the roads the trucks will travel, it is assumed that the health risk levels from the project traffic will be low compared to the total risk from all existing road traffic.

Since building wake effects (building downwash) influences can significantly increase concentrations for receptors located close to the emissions source, the proposed new building was modeled with a height of 30 ft.

The ARB model, EMFAC2007, was used for emission factors for diesel trucks both idling and operating to determine the total emissions of PM_{10} from the project-related trucks. See Appendix A for the details of this emissions factor derivation. Tables A and B show the development of the exhaust emission rates for the trucks while idling at the project buildings and while driving.

Receptors were placed at a grid approximately 2 by 2 km to characterize the regional risk levels and at locations of all identified sensitive receptors. Three years of meteorological data for the San Bernardino area from the SCAQMD[1] were used to represent the atmospheric conditions at the project site. All of these emissions sources, building parameters, and receptor data were modeled using the AERMOD air dispersion model to produce concentrations at receptors of interest. These concentrations were then incorporated into the HARP model with the emissions rates shown in Tables A and B to determine individual health risk levels. Appendix B includes the worksheets for this HRA.

[1] http://www.aqmd.gov/smog/metdata/MeteorologicalData.html.

Table A: Truck Activity and Diesel Particulate Emissions While Idling

Total Project ADT[1]	Vehicle Type	Fleet Percentage Breakdown	Total Trips per Day	% of Trucks That Are Diesel[2]	Diesel Trucks per Day	Diesel Idle Exhaust gm/min (on site)[3]	Idle Time (min/trip)[4]	Idle Exhaust Diesel PM_{10} (gm/day)
498	Pass. Car	79.6%	397	0.0%	0	0	0	0
	2 Axle[6]	3.5%	17	20.0%	3	0.0135	10	0.47
	3 Axle[6]	4.6%	23	70.0%	16	0.0135	10	2.2
	4+ Axle[7]	12.3%	61	100%	61	0.0086	10	5.3
Total Project Site Idling Emissions								**7.9**

1 Source: Urban Crossroads Traffic Study, February 2012.
2 Source: URBEMIS 2007 fleet diesel percentages.
3 Idling diesel exhaust emission factors from EMFAC2007 for fleet year 2020. This was used because a single emission rate is needed to represent changing emissions rates over the 70-year period of the HRA.
4 It is assumed that each truck idles for 10 minutes per trip to account for stopping at entry gate, loading and miscellaneous tasks.
5 2 & 3 axle trucks are assumed to be 50 percent light-heavy-duty (LHD) trucks and 50 percent medium-heavy-duty (MHD) trucks.
6 4+ axle trucks are assumed to be heavy-heavy-duty (HHD) trucks.

ADT = average daily traffic
gm/day = grams per day
gm/min = grams per minute
min/trip = minutes per trip
PM_{10} = particulate matter less than 10 microns in size

Table B: Diesel Truck On-Road Exhaust Emissions Rates

Total Project ADT	AADT by Vehicle Category			
	LDA	LDT	MDT	HDT
498	397	17	23	61
	Percent of Vehicles That Are Diesel-Powered			
	0%	20.0%	70.0%	100%
	Diesel Exhaust PM_{10} Emissions at 30 mph (g/s)			
	0	7.53E-08	1.73E-07	3.97E-06

Source: LSA Associates, Inc., February 2012.

AADT = annual average daily traffic
ADT = average daily traffic
g/s = grams per second
gm/day = grams per day
gm/min = grams per minute
HDT = heavy-duty trucks
LDA = light-duty autos
LDT = light-duty trucks
MDT = medium-duty trucks
mph = miles per hour
PM_{10} = particulate matter less than 10 microns in size

4.1.1 Acute Project-Related Emission Impacts

Exposure to diesel exhaust can result in immediate health effects. Diesel exhaust can irritate the eyes, nose, throat, and lungs, and it can cause coughs, headaches, lightheadedness, and nausea. In studies with human volunteers, diesel exhaust particles made people with allergies more susceptible to the materials to which they are allergic, such as dust and pollen. Exposure to diesel exhaust also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks. However, according to the rulemaking on *Identifying*

Particulate Emissions from Diesel-Fueled Engines as a Toxic Air Contaminant (ARB 1998), the available data from studies of humans exposed to diesel exhaust are not sufficient for deriving an acute noncancer health risk guidance value. While the lung is a major target organ for diesel exhaust, studies of the gross respiratory effects of diesel exhaust in exposed workers have not provided sufficient exposure information to establish a short-term noncancer health risk guidance value for respiratory effects. Since there are no significant emissions of toxic air pollutants that cause short-term acute health effects in the project vicinity, the potential for short-term acute exposure will be less than significant.

4.1.2 Carcinogenic and Chronic Project-Related Emission Impacts

The results of the conservative modeling are shown in Table C for carcinogenic and chronic inhalation health risks at the sensitive receptors. Even with the conservative modeling technique used (assuming that an individual stays outdoors at his or her residence 24 hours per day for 70 years, which is the State-required period of time that all HRAs must assess), the nearest sensitive receptor would be exposed to an unmitigated inhalation cancer risk of no more than 1.5 in 1 million, less than the threshold of 10 in a million. See Figure 3 for these residential carcinogenic risk levels. The Chronic Hazard Index would be 0.00096, less than the threshold of 1.0. These risk levels are much higher than are actually expected to occur. No significant health risk would occur from project-related truck traffic, and no mitigation is necessary. See Appendix C for the HARP model reports.

Table C: Long-Term Health Risk Levels from Project Operations

Location	Maximum Cancer Risk (risk per million)	Maximum Noncancer Risk (risk per million)
SCAQMD Threshold	10	1
Nearest Residential Neighborhood to the south	1.66	0.001
Nearest Residential Neighborhood to the east	0.38	0.0002
Significant?	**No**	**No**

Source: LSA Associates, Inc., February 2012.

Figure 3: Residential 70-Year Carcinogenic Risk Levels

5.0 REFERENCES

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Western Regional Climate Center, http://www.wrcc.dri.edu.

APPENDIX A

EMISSION FACTORS FOR DIESEL TRUCKS

APPENDIX B

HEALTH RISK ASSESSMENT WORKSHEETS

APPENDIX C

HARP MODELING REPORTS