NOTICE
PORTIONS OF THIS REPORT ARE ILLEGIBLE.
It has been reproduced from the best
available copy to permit the broadest
possible availability.

UCID--19284

DE82 006860

UCID- 19284

Burro-Series Gas-Concentration Contours

Ronald P. Koopman

MASTER

December 23, 1981

Lawrence
Livermore
Laboratory

This is an informal report intended primarily for internal or limited external distribution. The opinions and conclusions stated are those of the author and may or may not be those of the Laboratory.

Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore Laboratory under Contract W-7405-Eng-48.

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

STANDARD FORM NO. 7510-6251

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

DISCLAIMER

This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government thereof, and shall not be used for advertising or product endorsement purposes.

MASTER

Burro-Series Gas-Concentration Contours

Ronald P. Koopman,
P.O. Box 808
Lawrence Livermore National Laboratory
Livermore, California 94550

ABSTRACT

Gas concentration contours generated from the data taken during the Burro series experiments 8 and 9 are presented. The contours are presented as a function of time in both a horizontal and a vertical format for several areas within the array.

* Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under contract number W-7405-ENG-48.

The U.S. Department of Energy sponsored a series of nine field experiments (the Burro series), conducted jointly in 1980 by the Naval Weapons Center, China Lake, California, and the Lawrence Livermore National Laboratory, which were performed to determine the transport and dispersion of vapor from spills of liquefied natural gas (LNG) on water. Those tests, and the analysis of the data obtained from them, are discussed in other reports.^{1,2} The data central to much of that discussion are the gas concentration data and the contours generated from that data. Selected contours were presented as part of the analysis report.¹ It is the purpose of this report to simply present the complete time-series sets of contours for some of the more important tests.

The LNG vapor-concentration data were used to generate two-dimensional contour plots at 10-s time intervals during the experiments. A 10-s average was chosen somewhat arbitrarily; the intent was to use an averaging time that was long enough to average out short-wavelength (much less than cloud width) fluctuations, but short enough to preserve cloud meander. Contour plots are generated for several surfaces: horizontal surfaces at heights of 1 and 3 m above the ground, and vertical crosswind cylindrical surfaces at each row of the sensor array. The contours are of total hydrocarbon concentration, with data from the faster response-time instruments averaged, using a 10-s running average, so that all the data have approximately the same time constant. Therefore, the contours describe the 10-s average LNG vapor-concentration distribution on a surface at a given time.

The horizontal contours are calculated over a region that extends downwind from the spill point ($x = 0$) to the final row of sensors at 800 m. To close the contours in the source region, the concentration at $x = 0$ is

arbitrarily defined by a hyperbolic concentration distribution that is held constant during the spill and is decreased linearly to zero after the spill valve is closed.

In both the horizontal and vertical contour-plot concentrations, a "dummy" station is added to both ends of each sensor row at a distance equal to the station spacing for that row. When the LNG vapor cloud is well within the array and the concentration at the end of the row is essentially zero ($< 1\%$), the concentration at the corresponding "dummy" sensor is set equal to zero. If part of the cloud extends beyond the edge of the array, the "dummy" sensors are ignored and the contours are truncated at the edge of the array.

The gas concentration at each station location is set equal to zero at a height of 12 m. The concentration at the ground is extrapolated from the measured values at heights of 1 and 3 m. When the 3-m concentration is less than the 1-m value, the ground-level concentration is determined by using a quadratic extrapolation that passes through the 1- and 3-m concentration values and has a zero concentration gradient at the ground. For those cases where the 3-m concentration is greater than the 1-m value, the ground-level concentration is linearly extrapolated from these two values. Concentrations at points within the calculational region are determined by a linear interpolation in three dimensions.

Interpolating over the long distances between sensors in the 140-, 400-, and 800-m arcs produces some uncertainty in the calculation of gas-concentration values between these arcs. A linear interpolation scheme was used because of its inherent simplicity and ease of interpretation. If different interpolation schemes are used, different results will be obtained between arcs. In particular, the distance to the lower flammability limit

(LFL), i.e., the 5% contour for methane, is generally between the 140- and 400-m arcs for these tests. Comparing logarithmic interpolation with linear interpolation for concentration versus downwind distance data, typical of most of the tests, shows that logarithmic interpolation results in an LFL distance less than 20 m shorter than linear interpolation, a 10% effect. For the 2.5% contour, logarithmic interpolation produces a downwind distance which is about 35 m less than linear interpolation, also about a 10% effect. Analysis of contours from all of the experiments, using a variety of interpolation schemes, indicates that the uncertainty in the LFL distance is less than -40 to +20 m.

Since the distance between sensors on a tower and stations in an arc are much less than the distances between arcs, the uncertainty in contour location is much less for the vertical contours than it is for the horizontal contours. We estimate the uncertainty in the position of the vertical contours to be less than 1 m.

The Burro 8 and Burro 9 tests are the two most important tests in the experimental series. Burro 8 was performed under stable atmospheric conditions in an average wind speed of 1.8 m/s and showed most strongly the effects unique to dense gas dispersion. The horizontal gas concentration contours at 1 m above ground level for the Burro 8 test are shown in Figs. 1-20, at 20 second intervals, starting at 20 seconds and continuing for 400 seconds. The outermost contour shown is 1% followed by 2.5%, 5%, 10%, 15%, 25%, and 35% in sequence. The dotted contour is for a concentration 0.05% lower than the solid contour so that the sign of the gradient can be determined. On the Burro 8 test, the furthest extent of the LFL was recorded at the 3 m height between 380 seconds and 440 seconds. Horizontal contours at 3 m are shown for this time interval in Figs. 21-24. Vertical concentration

contours have also been constructed from the gas sensor data at each of the four arcs of stations. Shown in Figs. 25-44 are the vertical gas concentration contours from the 57-m arc, starting with 1% at the top followed by 2.5%, 5%, 15%, 25%, and 35%, plotted as a function of height above ground level. The contours are shown for 20 to 400 seconds, in 20 second increments, and are as would be seen when facing the pond from the down wind side. A similar set of vertical concentration contours for the 140-m arc of stations is shown in Figs 45-62 for 60 to 400 seconds in 20 second increments. Vertical contours for the 400-m arc are shown in Figs. 63-77 starting at 220 seconds and continuing to 500 seconds, in 20 second increments. Gas concentrations above the LFL reach this arc at 380 seconds as can be seen in Fig. 71. Concentration contours for the 800-m arc are not shown because these concentrations were always less than the LFL. These concentrations were used in generating the horizontal concentration contours, however.

The Burro 9 test was also important in that the facility achieved its highest spill rate, the wind field was such that the cloud stayed within the array over the duration of the experiment, and nearly all of our sensors were operational. The average wind speed was 5.7 m/s and the gas cloud behaved in a manner typical for the moderate or high wind speed tests. Horizontal gas concentration contours at 1 m above ground level are shown for Burro 9 in Figs. 78-91. The outermost contour is 1% followed by 2.5%, 5%, 7.5%, 10%, etc., in 2.5% increments. The horizontal contours at 3 m are not shown since the furthest extent of the LFL occurs at a height of 1 m in this test. Rapid phase transition (RPT) explosions occurred throughout this test throwing mud and water on the sensors in the 57-m arc. This data is not very reliable; consequently the vertical contours in the 57-m arc are not shown and the perturbation in the horizontal contours at 57-m should be

ignored. Vertical contours for the 140-m arc are shown in Figs. 92-101 for the period from 30 seconds to 170 seconds, in 10 second increments.

Similarly, vertical contours for the 400-m arc are shown in Figs. 102-110, starting at 90 seconds and continuing until 170 seconds in 10 second increments. Concentrations in the 800-m arc never exceed 2.5% and are not shown, although they were used to generate the horizontal contours.

References

1. R.P. Koopman, R.T. Cederwall, D.L. Ermak, H.C. Goldwire Jr., J.W. McClure, T.G. McRae, D.L. Morgan, H.C. Rodean, and J.H. Shinn, Description and Analysis of Burro Series 40-m³ LNG Spill Experiments, Lawrence Livermore National Laboratory, Livermore, California, UCRL-53186 (1981).
2. R.P. Koopman, L.M. Kamppinen, W.J. Hogan, and C.D. Lind, Burro Series Data Report: LLNL/NWC 1980 LNG Spill Tests, Lawrence Livermore National Laboratory, Livermore, California, UCID-19075 (1981).

06/16/81

Burro 8 1m. Contours:
Time: 20. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 1

06/16/81

Burro 8 1m. Contours:
Time: 40. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 2

06/16/81

Burro 8 1m. Contours:
Time: 60. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 3

06/16/81

Burro 8 1m. Contours:
Time: 80. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 4

06/16/81

Burro 8 1m. Contours:
Time: 100. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 5

06/16/81

Burro 8 1m. Contours:
Time: 120. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 6

06/16/81

Burro 8 1m. Contours:
Time: 140. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 7

06/16/81

Burro 8 1m. Contours:
Time: 160. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 8

06/16/81

Burro 8 1m. Contours:
Time: 180. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 9

06/16/81

Burro 8 1m. Contours:
Time: 200. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 10

06/16/81

Burro 8 1m. Contours:
Time: 220. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 11

06/16/81

Burro 8 1m. Contours:
Time: 240. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 12

06/16/81

Burro 8 1m. Contours:
Time: 260. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 13

06/16/81

Burro 8 1m. Contours:
Time: 280. sec. 1%.2.5%.5%.10%.15%.25%.35%

Figure 14

06/16/81

Burro 8 1m. Contours:
Time: 300. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 15

06/16/81

Burro 8 1m. Contours:
Time: 320. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 16

06/16/81

Burro 8 1m. Contours:
Time: 340. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 17

06/16/81

Burro 8 1m. Contours:
Time: 360. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 18

06/16/81

Burro 8 1m. Contours:
Time: 380. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 19

06/16/81

Figure 20

06/16/81

Burro 8 3m. Contours:
Time: 330. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 21

06/16/81

Burro 8 3m. Contours:
Time: 400. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 22

06/16/81

Burro 8 3m. Contours:
Time: 420. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 23

06/16/81

Burro 8 3m. Contours:
Time: 440. sec. 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 24

Burro 8 Row1
Time: 20. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 25

Burro 8 Row1
Time: 40. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 26

Burro 8 Row1

Time: 60. sec.

Contours:

1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 27

Burro 8 Row1

Time: 80. sec.

Contours:

1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 28

Burro 8 Row1
Time: 100. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 29

Burro 8 Row1
Time: 120. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 30

Burro 8 Row1
Time: 140. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 31

Burno 8 Row1
Time: 160. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 32

Burro 8 Row1
Time: 180. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 33

Burro 8 Row1
Time: 200. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 34

Burro 8 Row1
Time: 220. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 35

Burro 8 Row1
Time: 240. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 36

Burro 8 Row1
Time: 260. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 37

Burro 8 Row1
Time: 280. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 38

Burro 8 Row 1
Time: 300. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 39

Burro 8 Row1
Time: 320. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 40

Burro 8 Row1
Time: 340. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 41

Burro 8 Row1
Time: 360. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 42

Burro 8 Row1

Contours:

Time: 380. sec.

1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 43

Burro 8 Row1

Contours:

Time: 400. sec.

1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 44

Burro 8 Row2
Time: 60. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 45

Burro 8 Row2
Time: 80. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 46

Burro 8 Row2

Time: 100. sec.

Contours:

1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 47

Burro 8 Row2
Time: 120. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 48

Burro 8 Row2

Time: 140. sec.

Contours:

1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 49

Burro 8 Row2
Time: 160. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 50

Burro 8 Row2
Time: 180. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 51

Burro 8 Row2
Time: 200. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 52

Burro 8 Row2
Time: 220. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 53

Burro 8 Row2
Time: 240. sec.

Contours: 1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 54

Burro 8 Row2
Time: 260. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 55

Burro 8 Row2

Time: 280. sec.

Contours:

1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 56

Burro 8 Row2
Time: 300. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 57

Burro 8 Row2
Time: 320. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 58

Burro 8 Row2
Time: 340. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 59

Burro 8 Row2
Time: 360. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 60

Burro 8 Row2
Time: 380. sec.

Contours: .
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 61

Burro 8 Row2
Time: 400. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 62

06/16/81

Burro 8 Row3
Time: 220. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 63

06/16/81

Burro 8 Row3
Time: 240. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 64

06/16/81

Burro 8 Row3
Time: 260. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 65

06/16/81

Burro 8 Row3
Time: 280. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 66

06/16/81

Burro 8 Row3
Time: 300. sec.

Contours:
1%, 2.5%, 5%, 10%, 15%, 25%, 35%

Figure 67

06/16/81

Burro 8 Row3
Time: 320. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 68

06/16/81

Burro 8 Row3
Time: 340. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 69

06/16/81

Burro 8 Row3

Time: 360. sec.

Contours:

1%.2.5%.5%.10%.15%.25%.35%

Figure 70

06/16/81

Burro 8 Row3
Time: 380. sec.

Contours:
1%. 2.5%. 5%. 10%. 15%. 25%. 35%

Figure 71

06/16/81

Burro 8 Row3
Time: 400. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 72

06/16/81

Burro 8 Row3
Time: 420. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 73

06/16/81

Burro 8 Row3
Time: 440. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 74

06/16/81

Burro 8 Row3
Time: 460. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 75

06/16/81

Burro 8 Row3
Time: 480. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 76

06/16/81

Burro 8 Row3
Time: 500. sec.

Contours:
1%.2.5%.5%.10%.15%.25%.35%

Figure 77

Burrc 9 1m.
Time: 10. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 78

Burn 9 1m.
Time: 20. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 79

Burro 9 1m.
Time: 30. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 80

Burro 9 1m.
Time: 40. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 81

Burro 9 1m.
Time: 50. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 82

Burrc 9 1m.
Time: 60. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 83

Burrc 9 1m.
Time: 70. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 84

Burn 9 1m.
Time: 80. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 85

Burro 9 1m.
Time: 90. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 86

Burro 9 1m.
Time: 100. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 87

Burro 9 1m.
Time: 110. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 88

Burrc 9 1m.
Time: 120. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 89

Burn 9 1m.
Time: 130. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 90

Burrc 9 1m.
Time: 140. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 91

Burro 9 Row2
Time: 30. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 92

Burro 9 Row2
Time: 40. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 93

Burro 9 Row2
Time: 50. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 94

Burro 9 Row2
Time: 60. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 95

Burro 9 Row2
Time: 70. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 96

Burro 9 Row2
Time: 80. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 97

Burro 9 Row2
Time: 90. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 98

Burro 9 Row2
Time: 100. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 99

Burro 9 Row2
Time: 110. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 100

Burro 9 Row2
Time: 120. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 101

Burro 3 Row3
Time: 90. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 102

Burro 9, Row3
Time: 100. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 103

Burro 9 Row3
Time: 110. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 104

Burro 9 Row3
Time: 120. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 105

Burro 9 Row3
Time: 130. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 106

Burro 9 Row3
Time: 140. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 107

Burro 9 Row3
Time: 150. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 108

Burro 9 Row3
Time: 160. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 109

Burro 9 Row3
Time: 170. sec.

Contours:
1%, 2.5%, 5%, 7.5%, 10%

Figure 110