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FIVE-YEAR SUMMARY REPORT OF AN EXPERIMENTAL DAIRY HERD MAINTAINED ON THE NEVADA TEST SITE 1971 THROUGH 1975

Monitoring Systems Research and Development Division
Environmental Monitoring and Support Laboratory
U.S. ENVIRONMENTAL PROTECTION AGENCY
Las Vegas, NV 89114

Published June 1977

This study performed under a Memorandum
of Understanding No. EY-76-A-080539
for the
U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

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by
E. M. Daley

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ABSTRACT

The Environmental Monitoring and Support Laboratory - Las Vegas, U.S. Environmental Protection Agency, maintains an experimental dairy herd in Area 15 of the U.S. Energy Research and Development Administration's Nevada Test Site. This report covers the period January 1, 1971, through December 31, 1975, giving the status of the herd for this period of time. Improvements, changes, and additions made on the facilities, the production and reproduction statistics of individual cows and the herd, and summaries of metabolism studies that involved the dairy herd are also covered in this report.

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INTRODUCTION

The Environmental Monitoring and Support Laboratory-Las Vegas, of the U.S. Environmental Protection Agency has maintained an experimental dairy facility on the U.S. Energy Research and Development Administrations's Nevada Test Site since 1964. From 1964-1966, the entire dairy herd was maintained at Well 3 in Area 6 (see figure 1). In 1966, the lactating herd was transferred to the new facility at Area 15. Nonlactating cows and replacement heifers continued to be maintained at the Well 3 facility until 1972, and animal sacrifices were conducted there until 1973 when appropriate facilities became available at the Area 15 experimental farm.

The establishment of the experimental farm and the previous status reports on the dairy herd have been published (Douglas 1967, Smith and Engel 1969, and Smith 1970, 1973). Reports on the agronomic practices of the Area 15 experimental farm were published previously (Daley and Smith 1969, and Daley 1971, 1972, and 1976).

This report covers the period of January 1, 1971, through December 31, 1975. It lists changes and improvements made on facilities, presents herd and individual production and reproduction statistics, details health problems, and summarizes research studies that involved the dairy herd.

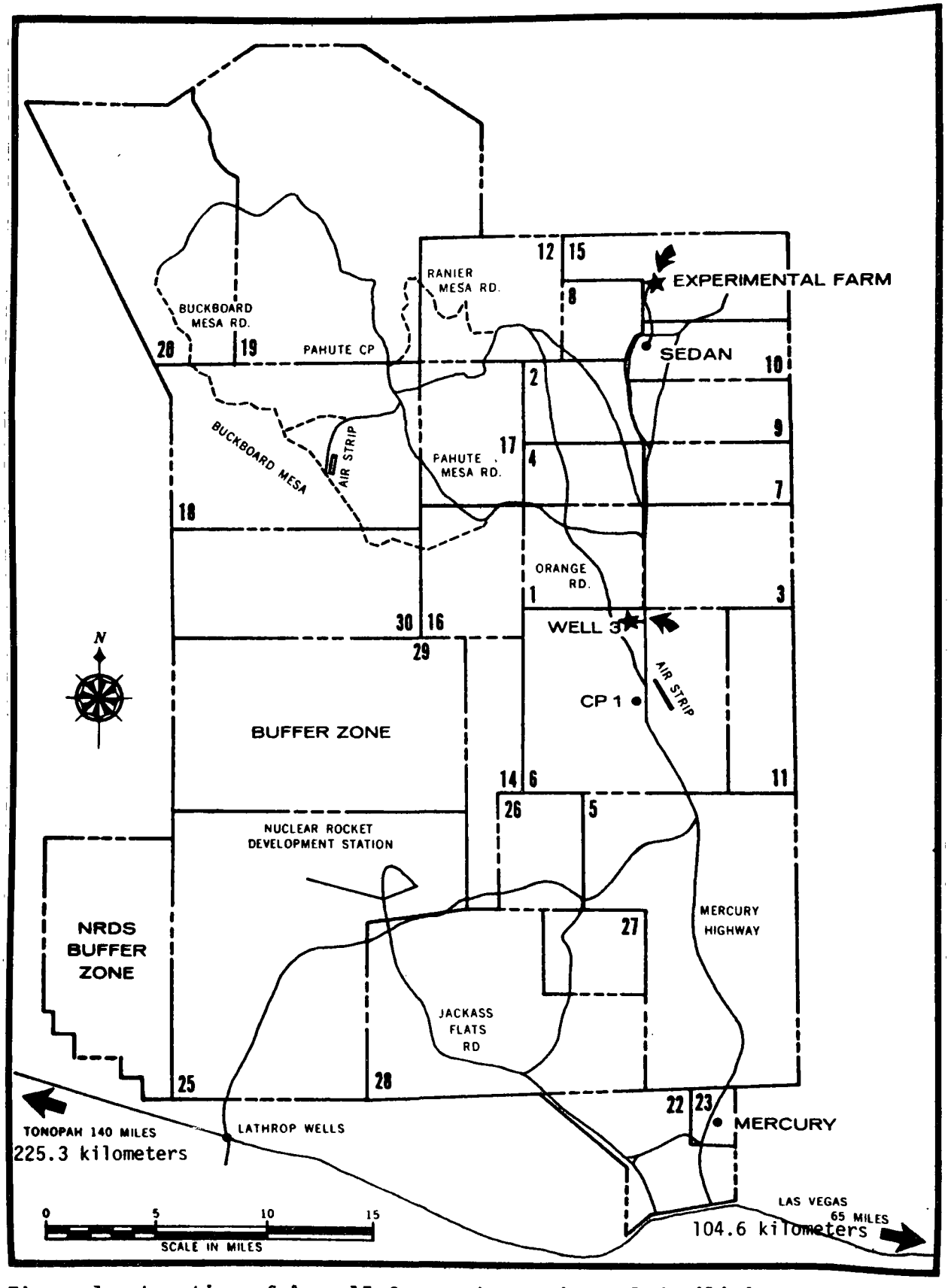

Figure 1. Location of Area 15 farm and experimental facilities on the Nevada Test Site 1970 through 1975.

FACILITIES AND EQUIPMENT

During the period covered by this report, as shown in figure 2, major modifications and additions were made to the Area 15 facility which allowed the abandonment of the Well 3 facility in 1973. This centralization of all dairy operations at Area 15 resulted in a much more economical and efficient operation in maintenance and feeding of the herd and provided improved experimental facilities for dairy cow metabolism studies.

CORRALS

Metal (Powder River®) panel-type corrals were erected at Area 15 in 1971 to replace the wooden corrals for the lactating herd and provide new corrals for the dry cows and heifers. Additional panels were erected in 1973 to provide for loafing areas for the lactating herd and for the dry cows and heifers. The metal corrals provide a more efficient means of handling the stock, require little or no maintenance, and add to the aesthetic value of the experimental farm.

METABOLISM ROOM

During 1972, a large animal metabolism facility was provided at Area 15 by converting the old telemetry and data analysis rooms and the biology laboratory into a metabolism area, with associated laboratory and radiation safety rooms (see figure 3). The specialized purpose of these areas required the installation of new sewer lines that drain into a contaminated waste sump at the southwest corner of the farm. In 1974, the drains were modified so that highly contaminated liquid waste could be diverted into enclosed tanks. This waste liquid is periodically pumped from the holding tanks into transport trailers and disposed of by pumping into deep wells designated for that purpose.

The metabolism area is large enough to accomodate up to six metabolism

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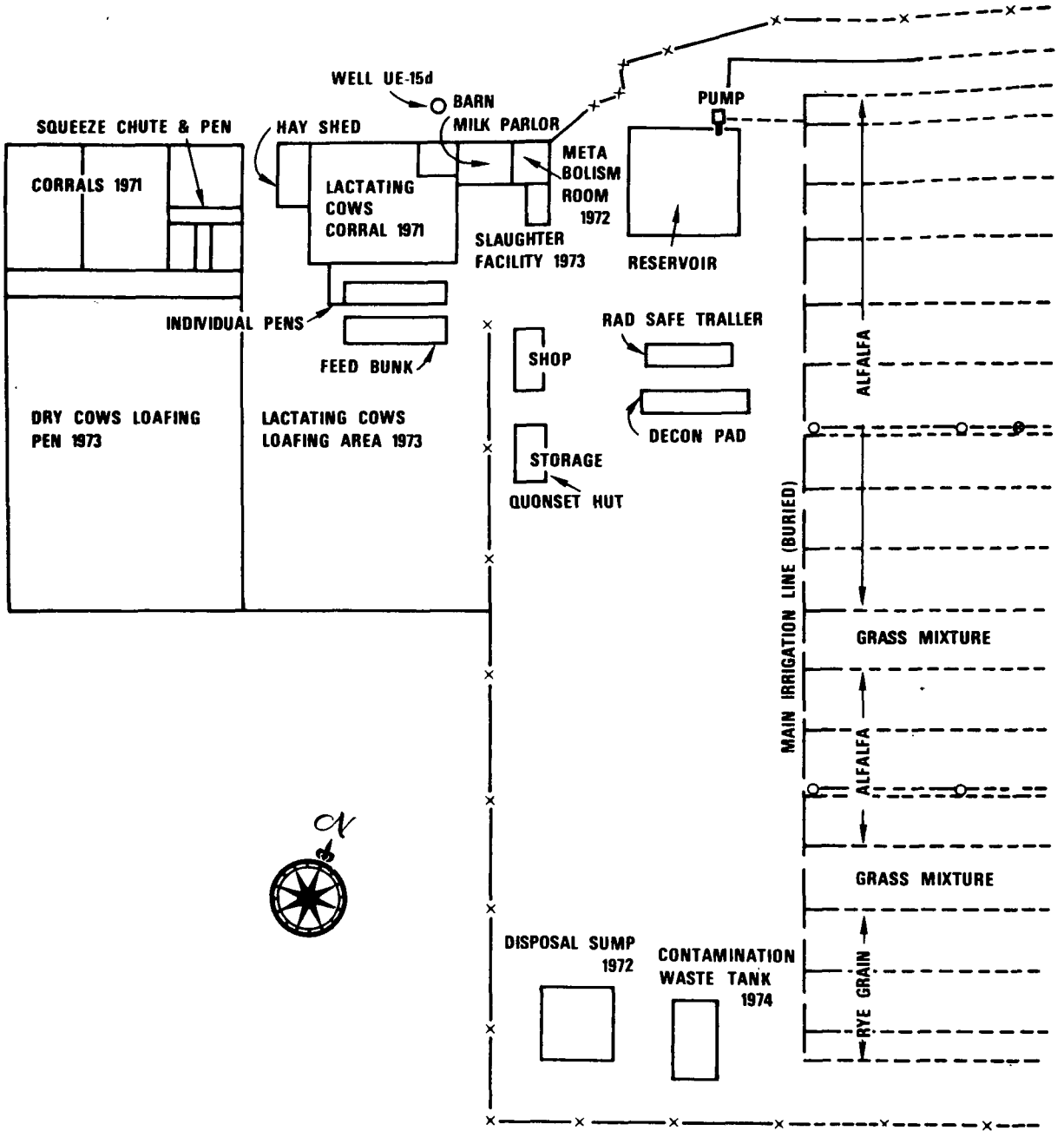

Figure 2. Layout of the Area 15 experimental dairy farm

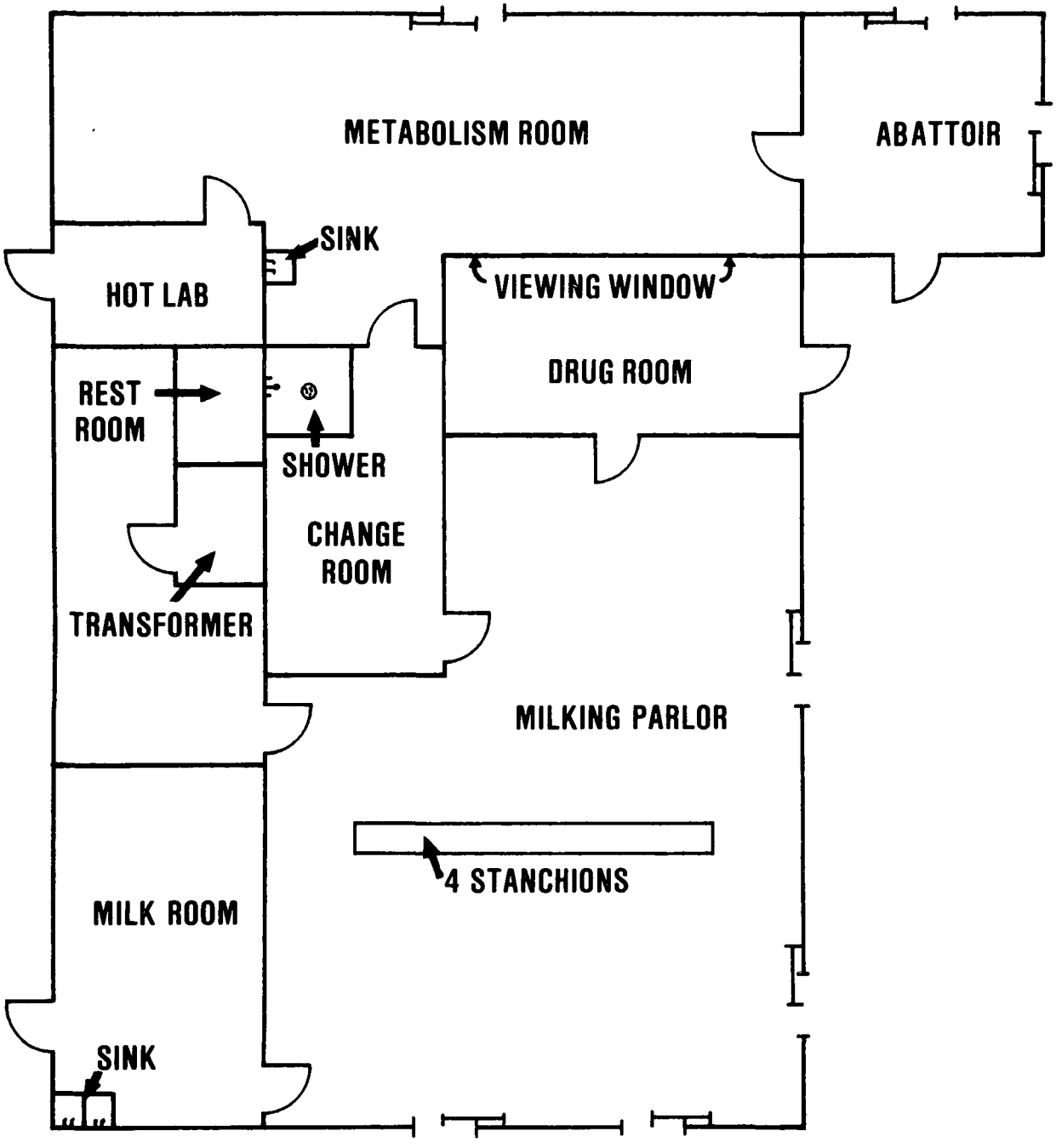

Figure 3. Floor plan of Area 15 experimental dairy barn

stalls. A separate vacuum pump with suspended vacuum lines was installed to provide the power for milking machines. A wash area was provided for sanitation of milking equipment. Overhead hose reels were installed to facilitate cleaning of study area and metabolism stalls.

The radiation safety room has a shower and clothes-changing area in addition to shelving for storage of radiation safety supplies needed for conducting studies. Also included in the study area is a sample control room that contains a laboratory bench, storage cabinets, and a hood equipped with a glove box. The vacuum pump for the milking system is also located in this room.

In 1975, a viewing window was installed in the drug room wall to enable monitors and researchers to observe experimental procedure and animals without requiring entry into the metabolism room.

ABATTOIR

During 1973, an additional wing (7.31 X 12.19 meters or 24 X 40 feet) with approximately 89 square meters (1,000 square feet) was connected to the southeast corner of the building to provide space for necropsy and sampling of large animals. This new abattoir has two floor drains in a gutter running the length of the building. These drains are also connected to the radioactive waste system. A 907.02 kilograms (1-ton) capacity, overhead, electric hoist was installed on a track with a maximum hook height of 3.35 meters (11 feet). A double compartment stainless steel sink with hot and cold running water was installed. The building has an electrical heating system and has evaporative coolers for cooling. The new slaughter facility provides a more efficient, convenient, and superior area for sample collection and processing.

MISCELLANEOUS

The hay shed was raised about 0.60 meters (2 feet) to allow truck passage for ease of unloading and stacking of hay.

The floor in the barn was resurfaced with an epoxy sand base in order to provide more traction for the animals and personnel.

Hard surfacing of the parking area was done during this period. Crushed rock was spread in the cow lot to fill in areas that had been eroded by heavy runoff water.

Due to pump failure, the Well UE-15d pump was pulled and a new pump installed during October 1974.

In 1973, a portable steel building was erected over the wellhead. This building protects the filter system and exposed waterlines from the elements, thus cutting maintenance costs.

HERD MANAGEMENT AND PRODUCTION

The vital statistics for all cows in the dairy herd from 1971 through 1975 are listed in appendix A. The dairy herd consists of a group of registered or grade Holstein cows which are maintained in the lots of the Area 15 experimental farm.

All forage is provided as green feed (alfalfa or rye or alfalfa-grass mixture), or as alfalfa hay. All green feed forage is produced on the farm while much of the hay is purchased. The lactating cows are fed a concentrate of 14-percent protein at each milking.

The milking procedures and dairy practices follow those commonly followed by producers in the Great Basin area, with two exceptions. First, the cows are milked on a schedule of 9- and 15-hour intervals in order to reduce labor requirements. Second, bucket milkers are used rather than a pipeline system so that individual milk samples can be collected without cross-contamination and to have an accurate record of milk production on the individual cow.

PRODUCTION

As shown in tables of appendix B, the herd average for the 5-year period was 4,134 kilograms (9,115 pounds) of milk per cow for the actual average 257-day lactation period. The extrapolated average for a 305-day lactation would be 4,926 kilograms (10,862 pounds) per day for 305 days. This is higher than the national average of 4,658 kilograms (10,271 pounds) of milk per cow (Dairy Illustrated 1976).

The production during the period January 1, 1971, through December 31, 1975, was lower than during the previous report periods (Smith and Engel 1969, and Smith 1970, 1973), when the average production was 6,046 kilograms (13,331 pounds) of milk per cow. At least two of the factors that caused

lower production are the number of terminal studies (12 animals) that required high milk producing cows and the fact that some of the heifers kept for replacement animals did not develop into high milk producing cows (see appendix B).

REPRODUCTION

During the period January 1, 1971, through December 31, 1975, 125 calves were born in the experimental dairy herd (see appendix C). Fifty-three of the calves were females and 72 were males. During this period, 10 sets of twins were born for a twinning percentage of 8.7 percent. This is significantly higher than the normal rate of 2 to 3 percent and slightly lower than the 9.4 percent reported previously by Smith (1973). Although the exact cause of this high incidence of twinning at the Nevada Test Site farm is not known, factors that might affect the rate include: 1) an increased genetic disposition toward twinning in certain family blood lines, 2) the above average nutritional plane of the herd, 3) an imbalance in the calcium phosphorus ratio (high calcium, low phosphorus), 4) stress conditions experienced by the cows which might upset the normal hormone balance and result in polyovulation, and 5) the therapeutic use of estrogen for infertility and breeding problems. Of the 125 calves, 32 were retained as replacements, 24 were transferred to the University of Nevada, Reno, 46 were euthanized because they were not needed in the program, 9 were sacrificed as part of experiments, and 14 were dead on arrival or died shortly after birth.

VETERINARY MEDICINE AND SURGERY

The major health problems encountered were related to the stresses of production (mastitis) and reproduction (infertility). Some lameness resulted from the stress of close confinement for long periods required for certain metabolism studies. No contagious diseases were diagnosed during this period. All illness or health problems were diagnosed by a veterinarian and recommended treatment followed.

A preventive medicine program and sanitation program were developed to decrease the incidence of preventable disease. This included routine palpation of the reproductive tract with indicated treatments for control of reproductive diseases, and the sanitation of milking equipment after each cow plus an antiseptic dipping of the teats after milking to control the spread of mastitis. Tympanites (bloat) was controlled by feeding poloxalene (Bloat Guard®) to the animals during the green feed season. Magnets were used routinely to help prevent traumatic reticulitis (hardware disease). The magnets were introduced into the reticulum of the cow to help prevent penetration of critical organs by attracting and holding ferrous metals (i.e., nails, wire, etc.).

Five cows died from natural causes during 1971-1975. Two died from tympanites during the evening hours when the herd was unattended, one died from gangrenous mastitis, one from traumatic reticulitis, and one died from excessive blood loss following self-amputation of a teat.

When possible, unproductive cows and cows that failed to respond to treatment were salvaged by using them for terminal studies involving technique development, or were transferred to other agencies. As shown in appendix A, 4 cows were euthanized because of terminal illnesses, 2 cows were used to develop techniques for handling radioactive contaminated cows, and 14 animals were transferred to the University of Nevada, Reno.

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DAIRY HERD INVOLVEMENT IN EXPERIMENTS

During 1971 to 1975, the dairy herd was used for six studies that defined the critical metabolic pathway of selected radionuclides which might appear in the environment following a nuclear detonation or operation of a nuclear reactor or result from an accident at a nuclear site. With the exception of project Tellus, all of these studies were performed under the auspice of the Nevada Applied Ecology Group's plutonium program.

The cows were selected for the experiments on the basis of production, stage of lactation, soundness of hoof and legs, temperament, and general health. The metabolism studies were conducted at the Well 3 facility until the Area 15 facilities were available in 1972. The animals were put into specially designed metabolism stalls which provided continuous restraint of the animal but still allowed sufficient movement for comfort and for milking and sampling. The stalls were equipped with individual food bunks and automatic waterers. A tray lined with a sheet of plastic was placed under a metal grate in the floor at the rear of the stall for fecal collection. An indwelling catheter was placed in the cow and the total urine production was collected in a plastic bottle for the duration of the experiment.

The studies conducted utilized one to four cows depending upon the experiment and the animals remained in the metabolism stall for 5 to 21 days depending on the isotope and objective of the studies. The selected radionuclides were administered either orally via a gelatin capsule or intravenously as an isotonic solution.

Samples of blood, urine, feces, and milk were collected on a 12-hour sampling schedule. Terminal studies were conducted and the animals were sacrificed to determine the tissue distribution of radionuclides in selected tissues, especially in muscle and organs which are usually sold for human consumption.

ABSORPTION, DISTRIBUTION, AND MILK SECRETION OF RADIOTELLURIUM BY THE DAIRY COW: PROJECT TELLUS (April 26 - May 1, 1971)

The objective of the study was to determine the tissue distribution, retention, and milk secretion of radiotellurium by dairy cows, and the concentration of radiotellurium in the tissues of calves.

Four lactating cows (numbers 21, 38, 87, and 128) were confined in metabolism stalls and each was given a single oral dose of tellurium-129m. For the next 5 days, all milk, urine, and feces from the cows were collected and the tellurium-129m content was measured. In a companion study, three calves (numbers 206, 207, and 210) were administered radiotellurium orally and sacrificed after varying time periods to determine tissue distribution. The radiotellurium was found to be distributed throughout the body of the calves with the main concentration occurring in the kidney and liver. This study has been published in the open literature (Mullen and Stanley, 1974).

ABSORPTION, DISTRIBUTION, AND EXCRETION OF PLUTONIUM BY DAIRY CATTLE: PROJECT PU-1 (May 17 - July 6, 1972) AND PROJECT PU-2 (April 26 - May 29, 1972)

The objectives of these studies were to obtain information on the significance of the milk link in man's food chain as a source of plutonium exposure and to gain additional information on plutonium patterns in ruminants. Two groups of Holstein cows, four cows in each group, were studied to examine the physiological transport of ingested plutonium citrate and plutonium dioxide.

For Project Pu-1, four lactating cows (numbers 45, 87, 128, and 39) were placed in the metabolism stalls where each was given a single oral dose of about 6 millicuries of plutonium-238. For the next 3 weeks, the total output of milk, urine, and feces was collected and the plutonium-238 content measured. At the end of 3 weeks, the cattle were moved to outside individual pens and weekly samples taken for an additional 4 weeks. Cows numbered 39 and 87 were sacrificed July 6, 1972, and samples of tissue and organs were collected and analyzed for plutonium-238.

For Project Pu-2, four lactating cows (numbers 117, 122, 134, and 185) were placed in metabolism stalls on April 26 and a daily dose of plutonium-238 dioxide was orally administered for 19 days. The cows remained in the stalls until May 21 when they were removed from the stalls and placed in individual

pens. Grab samples of urine and feces were collected until May 29 when the animals were removed from the individual pens and returned to the herd. Two of the cows (numbers 122 and 185) were sacrificed on June 24 and tissue samples were collected for radioanalysis. Details and results of these studies were published (Stanley et al., 1974).

As expected, the major portion of plutonium activity (approximately 96 percent in Group I and slightly less than 100 percent in Group II) was excreted in the feces. However, recovered activity in urine and milk following both the acute dose of plutonium citrate and the multiple doses of plutonium dioxide confirmed the physiological uptake and transport of both chemical forms. Total plutonium transport to milk was small and, based on a percent of oral dose, was observed to be 2×10^{-4} and 2×10^{-5} following the plutonium citrate and plutonium dioxide treatments (Stanley et al., 1974, 1975).

PASSAGE OF SAND PARTICLES THROUGH THE GASTROINTESTINAL TRACT OF DAIRY COWS: PROJECT PASS (November 10-25, 1974)

The objective of this study was to determine whether the rates of passage or residence time for particles in the ruminant digestive tract are related to particle size.

Silica sand of four graded-size ranges was obtained, and each size range was labeled by fusion with a gamma-emitting radioisotope. Each size range was divided into four portions and orally administered to each of four lactating Holstein dairy cows (numbers 123, 153, 184, and 241) maintained in metabolism stalls.

The cows were fed their normal daily ration of hay and pelleted food; water was provided ad libitum. The total fecal output from each cow was collected, weighed, and mixed to obtain a 24-hour composite sample. Samples were analyzed by gamma-ray spectroscopy to determine the content of labeled particles.

Although variations were observed among the four cows in the retention times for the various sized particles, longer retention times were consistently associated with the larger particles. The average residence times were:

Particle Size and Isotope Label	Average Residence Time (time to 63% excretion)
15-25 μm (^{141}Ce)	2.0 days
74-88 μm (^{85}Sr)	5.0 days
175-246 μm (^{54}Mn)	6.0 days
417-495 μm (^{46}Sc)	7.2 days

The smallest particles were excreted rapidly, while the three larger sizes were retained longer at similar residence times. In all cases, nearly 100 percent of the administered dose was recovered in the feces. Some of the sand particles which cattle may naturally ingest could remain in the gastrointestinal tract for a month or more. If such particles should contain relatively insoluble transuranic elements, this period would provide more time for reactions involved in gastrointestinal absorption (e.g., chelation and soluble compound formation), so uptake could be greater than that which would be derived from conventional studies carried out in ruminant digestion investigations (Smith et al., 1976, and Patzer et al., 1976).

BOVINE TRANSPORT AND RETENTION OF PLUTONIUM-238 WITH SPECIAL EMPHASIS ON THE GASTROINTESTINAL UPTAKE OF IN VIVO LABELED MILK: PROJECT PU-3 (April - May 1975) AND PROJECT PU-4 (November - December 1975)

A two-phase experiment was conducted to determine whether in vivo plutonium-labeled milk presents the nuclide in a more biologically available form than in in vitro plutonium preparations typically administered for intestinal uptake studies. A feasibility study (Phase I) used a total of two lactating cows (numbers 219 and 220) and four calves, while the more elaborate definitive study (Phase II) used four cows (numbers 123, 128, 119, and 179) and 12 calves. All calves were purchased from local dairy herds. Furthermore, two cull dairy cows (numbers 83 and 133) were used prior to this project in order to review detailed safety techniques for handling highly contaminated animals.

Phase I was directed primarily toward confirming the approximate quantity of plutonium for two different doses, an oral dose for calves and an intravenous

dose for the adult cows. Selection of an appropriate dose for the calves concerned plutonium concentrations needed for the in vivo labeled milk. This in vivo plutonium-labeled milk would have to contain a sufficiently high nuclide concentration to allow for the subsequent detection of plutonium in selected calf tissues. The second dose requiring confirmation was directly related to the oral dose for calves. It concerned the original intravenous dose to adult cows that would eventually result in the appropriate plutonium concentration per gram of milk. It should be noted that there are normal variations in daily milk production which can apparently alter either the plutonium concentration per gram of milk or the total amount of plutonium transferred to milk per collection. Furthermore, while the daily milk production of adult Holstein cows often approximates 20 liters, an individual 10-day-old calf will ingest only 2 to 4 liters of this milk per day.

The first adult cow received a single 83 mCi injection. Milk, urine, and fecal samples were taken for 72 hours after injection, but no tissue samples were collected at time of sacrifice 90 hours post-dosing. The second adult cow received an initial injection of 9.95 mCi, following which milk, urine, and fecal samples were collected. Three additional plutonium injections were sequentially administered to this animal (1 per day for 3 consecutive days) beginning 144 hours after the initial dose. Milk collections from this second animal were fed to the calves for 6 consecutive days.

Information gained during the feasibility study was applied to the design of a definitive effort (Phase II). Four adult cows were given a single intravenous injection of citrate-buffered plutonium-238 nitrate (approximately 16.6 mCi per animal). Plutonium-labeled milk from these cows, collected during the period of peak concentration, was fed to four calves. Four additional calves received in vitro plutonium-labeled milk prepared with approximately the same plutonium concentration as in the in vivo labeled milk. Each group of calves contained two control animals which were sacrificed along with the experimental calves. Tissues were collected from 11 of the 12 calves for plutonium analysis. Furthermore, for the Phase II effort, tissues were taken from the adult cows and analyzed for plutonium content.

In both phases, plutonium-238 was obtained as a dioxide from the Oak Ridge National Laboratory. It was dissolved in concentrated nitric acid with a trace of hydrofluoric acid before being converted to the citrate form. The doses were calibrated by liquid scintillation counting of the plutonium-238 alpha particles. Radionuclide solutions, approximately 5 ml by volume and 5 to 6 in pH, were administered to the adult cows by jugular venipuncture. The in vitro plutonium-labeled milk, given to the Phase II calves, was prepared by the addition of approximately 5 ml of a plutonium citrate solution per liter (gallon) of uncontaminated milk. This in vitro labeled milk was thoroughly shaken and samples were removed for direct counting to ensure homogeneity and known dosing concentrations.

Plutonium retained in the calf tissues, collected at time of sacrifice, will be used to compare the relative biological availability of plutonium in the two treatment groups. Analyses are also being made on excretion patterns and tissue retention of plutonium in the adult dairy cows used to produce the in vivo plutonium-labled milk. Portions of the resulting data have been presented at Nevada Applied Ecology Group meetings (Sutton et al., 1976) and a comprehensive report will be prepared following completion of radiochemical assays.

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APPENDIX A. VITAL STATISTICS AND ACQUISITION DATA OF MATURE DAIRY ANIMALS
JANUARY 1, 1971 DECEMBER 31, 1975

Cow No.	Date of Birth Age[1]	Weight[2] Type of Breeding	Cost and Acquisition Date	Remarks
2	November 1958[3] 13 years 5 months	530 kg Grade cow	$225 Spring 1964 Dispersal sale Idaho	Died May 10, 1972, from tympanites.
11	March 1960[3] 11 years 2 months	593 kg Grade cow	$225 Spring 1964 Dispersal sale Idaho	Sacrificed on May 20, 1971, semiannual sacrifice.
13	October 1960[3] 12 years 1 month	634 kg Grade cow	$225 Spring 1964 Dispersal sale Idaho	Transferred to UNR[4] November 1972.
16	November 1958[3] 14 years 7 months	673 kg Grade cow	$225 Spring 1964 Dispersal sale Idaho	Died May 16, 1973, from traumatic reticulitis.
21	March 26, 1962 11 years 9 months	611 kg Grade cow	$225 August 16, 1964 UNR[4]	Euthanized on January 7, 1971, lame, difficulty in rising and standing.
26	February 24, 1960 11 years	763 kg Registered cow	$400 Oats Brothers November 15, 1964	Died January 3, 1971, from excessive blood loss due to self-amputation of teat.
39	April 13, 1965 7 years 4 months	707 kg Registered cow	Born in herd. Dam was No. 28. Sire was Oats Brothers' bull.	Sacrificed on July 6, 1972. Project Pu-1.

[1]Age as of December 31, 1975, or death, or disposition.
[2]To convert to pounds: 2.205 X kilograms = pounds.
[3]Estimated date of birth, because no records prior to purchase.
[4]UNR = University of Nevada, Reno.

APPENDIX A. CONTINUED

Cow No.	Date of Birth Age[1]	Weight[2] Type of Breeding	Cost and Acquisition Date	Remarks
43	October 31, 1962 8 years 5 months	780 kg Registered cow	$450 Cantlon Farms July 23, 1965	Transferred to UNR[3] February 17, 1971.
45	April 14, 1960 13 years 2 months	602 kg Registered cow	$500 Oats Brothers July 23, 1965	Euthanized on June 13, 1973, traumatic reticulitis.
46	September 20, 1960 12 years 9 months	580 kg Registered cow	$500 Oats Brothers July 23, 1965	Euthanized on June 13, 1973, displaced abomasum.
47	April 17, 1958 12 years 1 month	668 kg Registered cow	$400 Oats Brothers July 23, 1965	Transferred to UNR[3] February 9, 1971.
48	March 7, 1962 9 years 5 months	711 kg Registered cow	$400 Oats Brothers July 23, 1965	Died August 24, 1971, from gangrenous mastitis.
71	April 3, 1966 9 years 10 months	668 kg Registered cow	Born in herd Dam was No. 48. Sire was Cantlon's Phantom.	Transferred to UNR[3] March 11, 1975.
83	June 19, 1962 12 years 6 months	630 kg Registered cow	$499 Oats Brothers November 16, 1966	Sacrificed on March 31, 1975, plutonium study animal handling technique development.
84	September 16, 1960 12 years 4 months	611 kg Registered cow	$450 Oats Brothers November 16, 1966	Euthanized on May 10, 1972, lameness, symptoms of nymphomania.

[1]Age as of December 31, 1975, or death, or disposition.
[2]To convert to pounds: 2.205 X kilograms = pounds.
[3]UNR = University of Nevada, Reno.

APPENDIX A. CONTINUED

Cow No.	Date of Birth Age[1]	Weight[2] Type of Breeding	Cost and Acquisition Date	Remarks
87	July 27, 1962 10 years	689 kg Registered cow	$600 Oats Brothers November 16, 1966	Sacrificed on July 6, 1972, Project Pu-1.
116	November 29, 1967 5 years 11 months	570 kg Grade cow	Born in herd. Dam was No. 11. Sire was No. 70.	Transferred to UNR[3] October 9, 1973.
117	November 30, 1967 5 years 8 months	727 kg Registered cow	Born in herd. Dam was No. 83.	Sacrificed on July 26, 1973, Project Pu-2.
119	December 23, 1967 7 years 11 months	698 kg Registered cow	Born in herd. Dam was No. 83. Sire was H37.	Sacrificed on November 11, 1975, Project Pu-4.
122	February 16, 1968 5 years 5 months	636 kg Grade cow	Born in herd. Dam was No. 2. Sire was No. 70.	Sacrificed on June 25, 1975, Project Pu-2.
123	February 21, 1968 7 years 9 months	595 kg Grade cow	Born in herd. Dam was No. 35. Sire was No. 70.	Sacrificed on November 18, 1975, Project Pu-4.
126	April 15, 1968 2 years 10 months	841 kg Grade bull	Born in herd. Dam was No. 16. Sire was No. 70.	Transferred to UNR[3] February 17, 1971.
127	April 24, 1968 7 years 8 months	582 kg Registered cow	Born in herd. Dam was No. 62. Sire was No. 70.	In herd.
128	May 16, 1968 7 years 7 months	641 kg Registered cow	Born in herd. Dam was No. 39. Sire was No. 70.	Sacrificed on November 18, 1975, Project Pu-4.

[1]Age as of December 31, 1975, or death, or disposition.
[2]To convert to pounds: 2.205 X kilograms = pounds.
[3]UNR = University of Nevada, Reno.

APPENDIX A. CONTINUED

Cow No.	Date at Birth Age[1]	Weight[2] Type of Breeding	Cost and Acquisition Date	Remarks
132	July 1, 1968 3 years 1 month	566 kg Registered cow	Born in herd. Dam was No. 47. Sire was No. 70.	Died July 8, 1971, from traumatic gastritis.
133	July 19, 1968 7 years 2 months	682 kg Registered cow	Born in herd. Dam was No. 13. Sire was No. 70.	Sacrificed on March 26, 1975, plutonium study animal handling technique development.
134	July 25, 1968 5 years	670 kg Registered cow	Born in herd. Dam was No. 27. Sire was No. 70.	Sacrificed on July 26, 1973, Project Pu-2.
135	August 7, 1968 7 years 1 months	680 kg Registered cow	Born in herd. Dam was No. 43. Sire was No. 70.	Transferred to UNR[3] March 11, 1975.
139	August 21, 1968 5 years 7 months	500 kg Grade cow	Born in herd. Dam was No. 21. Sire was No. 70.	Sacrificed on March 13, 1974, tissues used for quality assurance.
153	February 25, 1969 6 years 10 months	764 kg Grade cow	Born in herd. Dam was No. 71. Sire was No. 70.	In herd.
162	July 16, 1969 6 years 5 months	723 kg Grade cow	Born in herd. Dam was No. 21. Sire was No. 70.	Transferred to UNR[3] October 9, 1973.
159	June 14, 1969 6 years 6 months	623 kg Grade cow	Born in herd. Dam was No. 92. Sire was No. 70.	Died May 5, 1973, tympanites.

[1]Age as of December 31, 1975, or death, or disposition.
[2]To convert to pounds: 2.205 X kilograms = pounds.
[3]UNR = University of Nevada, Reno.

APPENDIX A. CONTINUED

Cow No.	Date of Birth Age[1]	Weight[2] Type of Breeding	Cost and Acquisition Date	Remarks
171	July 1, 1966 7 years 4 months	436 kg Registered Jersey cow	$450 November 6, 1969. Mills Jersey Farm. Fallon, Nevada.	Transferred to UNR[3] October 9, 1973.
172	May 5, 1965 8 years 6 months	400 kg Registered Jersey cow	$450 November 6, 1969. Mills Jersey Farm. Fallon, Nevada.	Transferred to UNR[3] October 9, 1973.
173	July 13, 1965 8 years 4 months	430 kg Registered Jersey cow	$450 November 6, 1969. Mills Jersey Farm. Fallon, Nevada.	Transferred to UNR[3] October 9, 1973.
174	August 8, 1965 8 years 3 months	434 kg Registered Jersey cow	$450 November 6, 1969. Mills Jersey Farm. Fallon, Nevada.	Transferred to UNR[3] October 9, 1973.
175	July 6, 1966 7 years 4 months	477 kg Registered Jersey cow	$300 November 6, 1969. Mills Jersey Farm. Fallon, Nevada.	Transferred to UNR[3] October 9, 1973.
179	December 9, 1969 6 years	773 kg Grade cow	Born in herd. Dam was No. 26. Sire was No. 70.	Sacrificed on November 11, 1975, Project Pu-4.
184	February 11, 1970 5 years 10 months	677 kg Grade cow	Born in herd. Dam was No. 117. Sire was H57.	In herd.

[1]Age as of December 31, 1975, or death, or disposition.
[2]To convert to pounds: 2.205 X kilograms = pounds.
[3]UNR = University of Nevada, Reno.

Cow No.	Date of Birth Age[1]	Weight[2] Type of Breeding	Cost and Acquisition Date	Remarks
185	February 16, 1970 3 years 4 months	725 kg Grade cow	Born in herd. Dam was No. 2. Sire was H306.	Sacrificed on June 25, 1973, Project Pu-2.
196	June 2, 1970 5 years 6 months	630 kg Grade cow	Born in herd. Dam was No. 122. Sire was No. 126.	Transferred to UNR[3] November 21, 1973.
197	July 1, 1970 5 years 5 months	756 kg Grade cow	Born in herd. Dam was No. 127. Sire was No. 126.	In herd.
198	July 1, 1970 5 years 5 months	795 kg Grade cow	Born in herd. Dam was No. 45. Sire was No. 126.	In herd.
208	December 17, 1970 5 years	713 kg Grade cow AI[4]	Born in herd. Dam was No. 39. Sire was H290.	In herd.
209	December 28, 1970 5 years	707 kg Grade cow	Born in herd. Dam was No. 21. Sire was No. 126.	In herd.
211	February 18, 1971 4 years 10 months	702 kg Grade cow AI[4]	Born in herd. Dam was No. 48. Sire was H322.	In herd.
218	May 18, 1971 4 years 7 months	768 kg Grade cow AI[4]	Born in herd. Dam was No. 122. Sire was H290.	In herd.
219	June 3, 1971 4 years 6 months	766 kg Grade cow AI[4]	Born in herd. Dam was No. 83. Sire was H314.	Sacrificed on April 19, 1975, Project Pu-3.
220	June 3, 1971 4 years 6 months	725 kg Grade cow AI[4]	Born in herd. Dam was No. 127. Sire was H290.	Sacrificed on May 5, 1975, Project Pu-3.

[1]Age as of December 31, 1975, or death, or disposition.
[2]To convert to pounds: 2.205 X kilograms = pounds.
[3]AI = artificial insemination.
[4]UNR = University of Nevada, Reno.

APPENDIX A. CONTINUED

Cow No.	Date of Birth Age[1]	Weight[2] Type of Breeding	Cost and Acquisition Date	Remarks
221	June 17, 1971 4 years 6 months	624 kg Grade cow	Born in herd. Dam was No. 139. Sire was No. 126.	In herd.
227	September 6, 1971 4 years 3 months	807 kg Grade cow	Born in herd. Dam was No. 162. Sire was No. 126.	In herd.
241	December 22, 1971 4 years	720 kg Grade cow	Born in herd. Dam was No. 128. Sire was H290.	In herd.
248	June 27, 1972 3 years 6 months	782 kg Grade cow AI[4]	Born in herd Dam was No. 127. Sire was H290.	Transferred to UNR[3] March 11, 1975.
250	July 3, 1972 3 years 5 months	527 kg Grade cow AI[4]	Born in herd. Dam was No. 83. Sire was H290.	In herd.
251	July 3, 1972 3 years 5 months	598 kg Grade cow AI[4]	Born in herd. Dam was No. 83. Sire was H290.	In herd.
252	July 8, 1972 3 years 5 months	630 kg Grade cow AI[4]	Born in herd. Dam was No. 153. Sire was H290.	In herd.
256	August 7, 1972 3 years 4 months	540 kg Grade cow AI[4]	Born in herd. Dam was No. 196. Sire was H290.	In herd.
257	August 7, 1972 3 years 4 months	541 kg Grade cow AI[4]	Born in herd. Dam was No. 196. Sire was H290.	Transferred to UNR[3] March 11, 1975.

[1]Age as of December 31, 1975, or death, or disposition.
[2]To convert to pounds: 2.205 X kilograms = pounds.
[3]UNR = University of Nevada, Reno.
[4]AI = artificial insemination.

APPENDIX A. CONTINUED

Cow No.	Date of Birth Age[1]	Weight[2] Type of Breeding	Cost and Acquisition Date	Remarks
269	November 7, 1972 3 years 1 month	504 kg Grade cow	Born in herd. Dam was No. 197. Sire was No. 216.	In herd.
278	July 1, 1973 2 years 5 months	682 kg Grade cow	Born in herd. Dam was No. 184. Sire was No. 216.	In herd.
280	July 6, 1973 2 years 5 months	602 kg Grade cow	Born in herd. Dam was No. 196. Sire was No. 216.	In herd.
281	July 8, 1973 2 years 5 months	630 kg Grade cow	Born in herd. Dam was No. 135. Sire was No. 216.	In herd.
284	August 15, 1973 2 years 4 months	534 kg Grade cow	Born in herd. Dam was No. 83. Sire was No. 216.	In herd.

[1]Age as of December 31, 1975, or death, or disposition.
[2]To convert to pounds: 2.205 X kilograms = pounds.

B-1. MILK PRODUCTION OF COWS FROM JANUARY 1, 1971, THROUGH DECEMBER 31, 1971

Cow No.	Production (kg)[1]	Lactation (days)	From	To
13	5,692	313	09/28/70	08/06/71
21	8,188	305	01/07/71	11/08/71
39	3,233	252	12/17/70	08/26/71
48	4,546	198	02/07/71	08/24/71[2]
71	4,090	219	04/15/71	11/20/71
87	7,757	305	10/14/70	08/15/71
116	4,566	293	01/02/71	10/21/71
117	2,967	212	04/13/71	11/20/71
122	3,613	175	05/19/71	11/10/71
128	5,593	302	01/13/71	11/03/71
133	1,174	122	04/10/71	08/10/71
134	4,119	293	11/15/70	09/04/71
135	4,528	289	01/13/71	11/29/71
139	2,126	165	05/29/71	11/10/71
171	2,450	137	05/09/71	09/23/71
175	4,828	289	03/03/71	12/17/71

Average Production 4,342 kilograms

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]Died

B-2. MILK PRODUCTION OF COWS FROM JANUARY 1, 1972, THROUGH DECEMBER 31, 1972

Cow No.	Production (kg)[1]	Lactation (days)	From	To
2	3,634	188	11/04/71	05/10/72[2]
13	5,831	317	11/18/71	10/01/72
16	7,012	310	08/04/71	03/31/72
45	6,192	298	11/27/71	09/15/72
46	5,680	289	10/27/71	08/11/72
83	6,966	303	08/02/71	03/31/72
117	3,525	223	04/13/72	11/22/72
119	4,771	305	07/06/71	05/06/72
122	3,386	222	04/02/72	11/22/72
123	4,459	217	09/13/71	04/17/72
127	4,783	271	08/12/71	03/09/72
128	6,537	283	12/23/71	10/01/72
134	5,236	284	11/22/71	09/01/72
153	4,842	306	08/02/71	06/03/72
153	2,941	137	07/09/72	11/23/72
159	2,161	200	09/29/71	04/16/72
159[3]	459	57	09/27/72	11/23/72
162	2,884	220	09/10/71	04/17/72
173	4,717	301	08/25/71	06/21/72
174	3,890	300	09/04/71	06/30/72
179	2,643	224	09/07/71	04/18/72
184[3]	333	44	08/08/72	09/21/72
185	3,959	308	09/04/71	07/08/72
196[3]	119	37	08/07/72	09/13/72
197[3]	30	12	11/01/72	11/12/72

Average Production 4,574 kilograms

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]Died
[3]Not included in the average, less than 100 days production

B-3. MILK PRODUCTION OF COWS FROM JANUARY 1, 1973, THROUGH DECEMBER 31, 1973

Cow No.	Production (kg)[1]	Lactation (days)	From	To
16	5,695	249	09/09/72	05/16/73
21	7,717	303	04/27/72	02/24/73
83	4,689	266	07/04/72	03/27/73
116	5,641	308	02/05/72	10/09/73
117	2,810	123	03/25/73	07/26/73[2]
119	6,112	312	08/04/72	06/12/73
122[3]	2,225	89	03/28/73	06/25/73[2]
123	3,940	260	10/02/72	06/19/73
127	5,926	318	06/27/72	05/11/73
128	6,589	320	12/08/72	10/24/73
133	4,119	304	05/03/72	03/03/73
134	4,698	265	11/03/72	07/26/73[2]
135	5,927	303	05/28/72	03/27/73
162	3,064	187	10/21/72	04/26/73
171	5,664	305	12/08/72	10/09/73
173	3,560	239	07/31/72	03/27/73
174	3,972	304	12/09/72	10/09/73
175	5,078	304	04/23/72	02/21/73
179	4,476	317	09/23/72	08/06/73
185	3,590	194	12/13/72	06/25/73[2]
196[3]	307	56	07/06/73	08/31/73
198	1,444	159	11/16/72	04/24/73
211	2,005	275	11/29/72	08/31/73
71	2,554	195	09/13/72	03/27/73

Average Production 4,512 kilograms

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]Sacrificed
[3]Not included in the average, less than 100 days production

B-4. MILK PRODUCTION OF COWS FROM JANUARY 1, 1974, THROUGH DECEMBER 31, 1974

Cow No.	Production (kg)[1]	Lactation (days)	From	To
71	4,076	275	01/18/74	10/16/74
83	2,066	278	08/16/74	05/21/74
119	5,698	293	01/15/73	09/19/74
123	4,364	270	03/18/74	12/14/74
127	4,147	259	11/15/73	07/01/74
128	5,967	294	11/30/73	09/19/74
133	3,867	263	04/12/74	12/28/74
135	4,768	278	07/09/73	04/13/74
139	4,120	228	07/03/73	02/16/74
153	3,232	229	08/27/73	04/13/74
179	4,385	263	10/16/73	07/06/74
184	3,640	286	05/25/74	04/13/74
197[2]	31	7	01/14/74	01/22/74
198	4,174	272	01/16/74	10/16/74
208	1,388	179	10/16/73	04/13/74
209	4,746	302	11/21/73	09/19/74
211	3,603	238	04/19/74	12/14/74
218	1,696	159	11/05/73	04/13/74
219	4,043	322	11/01/73	09/19/74
220	4,158	326	10/28/73	09/19/74
221	801	127	12/07/73	04/13/74

Average Production 3,732 kilograms

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]Not included in average, less than 100 days production

B-5. MILK PRODUCTION OF COWS FROM JANUARY 1, 1975, THROUGH DECEMBER 31, 1975

Cow No.	Production (kg)[1]	Lactation (days)	From	To
83	3,486	264	07/10/74	03/31/75
119[2]	703	37	10/05/75	11/11/75
123[2]	887	44	10/05/75	11/18/75
127	4,098	305	09/15/74	07/16/75
128	2,177	113	07/29/75	11/18/75
133[2]	194	8	03/18/75	03/26/75
153	2,834	203	10/09/74	04/20/75
179	3,012	229	12/09/74	07/25/75
184	3,593	279	08/25/74	02/26/75
197	3,865	197	03/24/75	10/07/75
208	3,304	245	03/08/75	11/07/75
209	4,353	309	11/25/74	09/27/75
218	2,377	160	11/09/74	04/20/75
219[2]	799	35	03/16/75	04/19/75
220[2]	1,683	78	02/16/75	05/05/75
221	4,435	275	02/06/75	11/07/75
227	2,759	307	04/12/74	02/14/75
241	3,825	307	05/28/74	03/31/75
250	4,194	306	12/05/75	10/06/75
251	4,069	310	11/13/74	09/18/75
252	3,423	294	02/12/75	12/03/75
256	3,118	274	02/07/75	11/07/75
269	4,179	283	01/29/75	11/07/75
278[2]	1,102	91	09/25/75	12/25/75

Average Production 3,508 kilograms

[1]To convert to pounds: 2.205 x kilograms = pounds.
[2]Not included in the average, less than 100 days production

APPENDIX C. CALVES BORN INTO HERD FROM JANUARY 1, 1971 - DECEMBER 31, 1975

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
210	01/12/71	M	40	135	126	Holstein	Transferred to UNR[2] November 28, 1971.
211	02/18/71	F	38	48	H322	Holstein	Retained as replacement animal in herd.
212	02/21/71	M	32	175	126	Jersey Holstein Crossbred	Transferred to UNR[2] November 28, 1971.
213	04/10/71	F	30	133	512	Holstein Hereford Crossbred	Twin of 214. Transferred to UNR[2] November 28, 1971.
214	04/10/71	M	30	133	512	Holstein Hereford Crossbred	Twin of 213. Transferred to UNR[2] November 28, 1971.
215	04/21/71	F	39	117	512	Holstein Hereford Crossbred	Transferred to UNR[2] November 28, 1971.
216	04/24/71	M	48	71	126	Holstein	Sacrificed March 13, 1974. Belligerent and deemed safety hazard. Tissues used for quality assurance.
217	05/09/71	M	32	171	J4931	Jersey	Euthanized May 10, 1971. Not needed in program.
218	05/18/71	F	45	122	H290	Holstein	Retained as replacement animal in herd.
219	06/03/71	F	44	83	H314	Holstein	Retained as replacement animal in herd. Sacrificed April 19, 1975, Project Pu-3.
220	06/03/71	F	37	127	H290	Holstein	Retained as replacement animal in herd. Sacrificed May 5, 1975, Project Pu-3.
221	06/17/71	F	35	139	126	Holstein	Retained as replacement animal in herd.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]UNR = University of Nevada, Reno.

APPENDIX C. CONTINUED

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
222	06/24/71	M	41	16	H322	Holstein	Transferred to UNR[2] November 28, 1971.
223	06/05/71	M	41	119	H63	Holstein	Transferred to UNR[2] November 28, 1971.
224	08/02/71	M	41	153	126	Holstein	Transferred to UNR[2] November 28, 1971.
225	08/24/71	M	30	173	J4931	Jersey	Euthanized August 24, 1971. Not needed in program.
226	09/04/71	M	35	185	187	Holstein	Euthanized September 5, 1971. Not needed in program.
227	09/06/71	F	38	162	126	Holstein	Retained as replacement animal in herd.
228	09/09/71	M	41	123	126	Holstein	Transferred to UNR[2] November 28, 1971.
229	09/16/71	M	33	174	126	Holstein	Sacrificed August 30, 1972.
230	09/19/71	M	34	179	187	Holstein	Euthanized September 20, 1971. Not needed in program.
231	09/27/71	F	NW[3]	159	126	Holstein	Twin of 232. Transferred to UNR[2] October 9, 1973.
232	09/27/71	M	NW[3]	159	126	Holstein	Twin of 231. Transferred to UNR[2] October 9, 1973.
233	10/27/71	M	NW[3]	46	126	Holstein	Twin of 234. Dead on arrival.
234	10/27/71		NW[3]	46	126	Holstein	Twin of 233. Dead on arrival.
235	11/13/71	F	36	2	H290	Holstein	Retained as replacement animal in herd.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]UNR = University of Nevada, Reno.
[3]NW = Not weighed

APPENDIX C. CONTINUED

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
236	11/19/71	M	42	13	126	Holstein	Euthanized November 19, 1971. Not needed in program.
237	11/19/71	M	41	39	126	Holstein	Euthanized November 19, 1971. Not needed in program.
238	11/21/71	M	42	134	126	Holstein	Died December 19, 1971. Cause of death pneumonia.
239	11/21/71	M	45	456	H290	Holstein	Dead on arrival.
240	11/24/71	F	37	87	126	Holstein	Died from injury November 28, 1971.
241	11/22/71	F	39	128	H290	Holstein	Retained as replacement animal in herd.
242	04/14/72	M	38	117	H290	Holstein	Sacrificed October 19, 1972, feed lot study.
243	04/15/72	M	41	122	H290	Holstein	Euthanized April 16, 1972. Not needed in program.
244	04/27/72	M	39	21	H290	Holstein	Euthanized April 27, 1972. Not needed in program.
245	05/02/72	M	37	133	H290	Holstein	Euthanized August 12, 1972. Not needed in program.
246	05/27/72	M	41	135	H290	Holstein	Euthanized August 12, 1972. Not needed in program.
247	06/27/72	M	32	127	H290	Holstein	Twin of 248. Euthanized August 12, 1972. Not needed in program.
248	06/27/72	F	32	127	H290	Holstein	Twin of 247. Transferred to UNR[2] March 11, 1975.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]UNR = University of Nevada, Reno.

APPENDIX C. CONTINUED

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
249	06/29/72	M	27	171	J4931	Jersey	Euthanized August 12, 1972. Not needed in program.
250	07/03/72	F	32	83	H290	Holstein	Twin of 251. Retained as replacement animal in herd.
251	07/03/72	F	34	83	H290	Holstein	Twin of 250. Retained as replacement animal in herd.
252	07/08/72	F	45	153	H290	Holstein	Retained as replacement animal in herd.
253	07/30/72	M	36	173	J4931	Jersey	Euthanized August 12, 1972. Not needed in program.
254	08/01/72	F	23	175	J4931	Jersey	Transferred to UNR[2] November 21, 1973.
255	08/03/72	M	41	119	H290	Holstein	Euthanized August 12, 1972. Not needed in program.
256	08/07/72	F	30	196	H290	Holstein	Twin of 257. Retained as replacement animal in herd.
257	08/07/72	F	32	196	H290	Holstein	Twin of 256. Transferred to UNR[2] March 11, 1975.
258	08/17/72	M	34	184	514	Holstein Hereford Crossbred	Twin to 259. Euthanized August 18, 1972.
259	08/17/72	M	32	184	514	Holstein Hereford Crossbred	Twin to 258. Euthanized August 18, 1972.
260	08/29/72	M	36	116	514	Holstein Hereford Crossbred	Euthanized August 29, 1972. Not needed in program.
261	08/31/72	M	27	174	J4931	Jersey	Euthanized August 31, 1972. Not needed in program.
262	09/12/72	M	36	71	514	Holstein Hereford Crossbred	Euthanized September 13, 1972. Not needed in program. program.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]UNR = University of Nevada, Reno.

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
263	09/13/72	M	NW[2]	16	514	Holstein Hereford Crossbred	Euthanized September 13, 1972. Not needed in program.
264	09/22/72	M	41	179	H290	Holstein	Euthanized September 23, 1972. Not needed in program.
265	10/01/72	M	34	123	514	Holstein Hereford Crossbred	Euthanized October 10, 1972. Not needed in program.
266	10/04/72	F	38	159	514	Holstein	Dead at birth.
267	10/21/72	F	32	162	514	Holstein Hereford Crossbred	Euthanized October 21, 1972. Not needed in program.
268	11/03/72	F	41	134	H290	Holstein	Retained as replacement animal in herd. Died October 13, 1974 of bloat.
269	11/07/72	F	38	197	216	Holstein	Retained as replacement animal in herd.
270	11/16/72	M	38	198	216	Holstein	Euthanized November 17, 1972. Not needed in program.
271	11/28/72	M	41	211	216	Holstein	Euthanized November 28, 1972. Not needed in program.
272	12/08/72	M	38	128	H290	Holstein	Euthanized December 8, 1972. Not needed in program.
273	12/12/72	F	34	185	515	Holstein Hereford Crossbred	Euthanized March 25, 1973. Not needed in program.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]NW = Not weighed

APPENDIX C. CONTINUED

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
274	03/24/73	M	32	117	216	Holstein	Twin of 275. Euthanized March 25, 1973. Not needed in program.
275	03/24/73	F	27	117	216	Holstein	Twin of 274. Euthanized March 25, 1973. Not needed in program.
276	03/27/73	M	45	122	H290	Holstein	Tissues used for tritium studies.
277	04/18/73	F	40	133	216	Holstein	Transferred to UNR[2] March 11, 1975.
278	07/01/73	F	38	184	216	Holstein	Retained as replacement animal in herd.
279	07/02/73	M	41	139	216	Holstein	Euthanized July 2, 1973. because of broken leg.
280	07/06/73	F	43	196	216	Holstein	Retained as replacement animal in herd.
281	07/08/73	F	38	135	216	Holstein	Retained as replacement animal in herd.
282	07/16/73	M	27	173	J4931	Jersey	Transferred to UNR[2] November 21, 1973.
283	07/17/73	M	45	21	216	Holstein	Transferred to UNR[2] November 21, 1973.
284	08/15/73	F	38	83	216	Holstein	Retained as replacement animal in herd.
285	08/26/73	F	NW[3]	153	216	Holstein	Dead at birth.
286	10/15/73	F	38	127	H290	Holstein	Retained as replacement animal in herd.
287	10/16/73	M	41	208	216	Holstein	Transferred to UNR[2] March 11, 1975.
288	10/16/73	M	38	179	216	Holstein	Transferred to UNR[2] March 11, 1975.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]UNR = University of Nevada, Reno.
[3]NW = Not weighed

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
289				(Number not used)			
290	11/04/73	M	41	218	216	Holstein	Transferred to UNR[2] March 11, 1975.
291	11/07/73	M	38	220	216	Holstein	Transferred to UNR[2] March 11, 1975.
292	11/28/73	F	41	128	216	Holstein	Retained as replacement animal in herd.
293	12/03/73	M	43	209	216	Holstein	Transferred to UNR[2] March 11, 1975.
294	12/06/73	F	38	221	216	Holstein	Retained as replacement animal in herd.
295	12/11/73	M	41	119	216	Holstein	Transferred to UNR[2] March 11, 1975.
296	01/12/74	M	NW[3]	197	216	Holstein	Dead on arrival.
297	01/16/74	F	36	198	216	Holstein	Retained as replacement animal in herd.
298	01/17/74	M	NW[3]	71	216	Holstein	Dead on arrival.
299	03/18/74	F	38	123	H290	Holstein	Retained as replacement animal in herd.
300	04/12/74	M	39	227	216	Holstein	Transferred to UNR[2] March 11, 1975.
301	04/12/74	M	NW[3]	133	216	Holstein	Twin of 302. Dead on arrival.
302	04/12/74	F	NW[3]	133	216	Holstein	Twin of 301. Dead on arrival.
303	04/19/74	M	41	211	19/H63	Holstein	Euthanized. Not needed in program.
304	05/25/74	M	NW[3]	184	19/H63	Holstein	Twin of 305. Dead on arrival.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]UNR = University of Nevada, Reno.
[3]Not weighed

APPENDIX C. CONTINUED

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
305	05/25/74	F	NW[2]	184	19/H63	Holstein	Twin of 304. Dead on arrival.
306	06/15/74	M	38	241	216	Holstein	In herd. Steer.
307	07/10/74	F	41	83	216	Holstein	Retained as replacement animal in herd.
308	09/13/74	M	38	127	19/H63	Holstein	Euthanized, September 14, 1974. Not needed in program.
309	09/29/74	M	43	153	19/H63	Holstein	Euthanized, September 14, 1974. Not needed in program.
310	11/11/74	F	41	218	19/H63	Holstein	Retained as replacement animal in herd.
311	11/11/74	F	36	179	19/H63	Holstein	Retained as replacement animal in herd.
312	11/11/74	F	36	251	216	Holstein	Retained as replacement animal in herd.
313	11/25/74	F	41	209	19/H63	Holstein	Retained as replacement animal in herd.
314	12/03/74	F	38	250	216	Holstein	Retained as replacement animal in herd.
315	12/07/74	F	41	197	216	Holstein	Retained as replacement animal in herd.
316	01/28/75	M	NW[2]	269	3919	Holstein	Dead on arrival.
317	02/05/75	F	34	221	517	Holstein Hereford Crossbred	Sacrificed May 22, 1975. Not needed in program.
318	02/11/75	M	36	252	517	Holstein Hereford Crossbred	Euthanized. Not needed in program.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]NW = Not weighed

APPENDIX C. CONTINUED

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
319	02/15/75	M	41	220	3919	Holstein	Sacrificed May 22, 1975. Not needed in program.
320	02/24/75	F	38	256	517	Holstein Hereford Crossbred	Sacrificed May 22, 1975. Not needed in program.
321	03/07/75	F	34	208	517	Holstein Hereford Crossbred	Sacrificed May 22, 1975. Not needed in program.
322	03/15/75	F	38	219	3919	Holstein	Retained as replacement animal in herd.
323	03/18/75	M	41	133	3919	Holstein	Sacrificed May 22, 1975. Not needed in program.
324	07/21/75	M	43	128	3919	Holstein	Euthanized July 23, 1975. Not needed in program.
325	08/21/75	M	36	198	517	Holstein Hereford Crossbred	Euthanized August 22, 1975. Not needed in program.
326	09/02/75	M	45	211	H191	Holstein	Euthanized September 3, 1975. Not needed in program.
327	09/24/75	F	36	278	517	Holstein Hereford Crossbred	Euthanized September 25, 1975. Not needed in program.
328	09/28/75	F	38	123	517	Holstein Hereford Crossbred	Euthanized September 29, 1975. Not needed in program.
329	10/01/75	F	36	179	517	Holstein Hereford Crossbred	Euthanized October 1, 1975. Not needed in program.
330	10/05/75	M	NW[2]	119	517	Holstein Hereford Crossbred	Euthanized October 6, 1975. Not needed in program.

[1]To convert to pounds: 2.205 X kilograms = pounds.
[2]NW = Not weighed

APPENDIX C. CONTINUED

Animal No.	Birth Date	Sex	Wt.[1] (kg)	Dam No.	Sire No.	Breed	Remarks
331	11/25/75	M	41	281	517	Holstein Hereford Crossbred	Euthanized November 26, 1975. Not needed in program.
332	12/04/75	M	36	280	517	Holstein Hereford Crossbred	Euthanized December 5, 1975. Not needed in program.
333	12/07/75	M	41	184	517	Holstein Hereford Crossbred	Euthanized December 7, 1975. Not needed in program.
334	12/11/75	M	43	284	517	Holstein Hereford Crossbred	Euthanized December 12, 1975. Not needed in program.
335	12/18/75	M	45	241	517	Holstein Hereford Crossbred	Euthanized December 21, 1975. Not needed in program.

[1]To convert to pounds: 2.205 X kilograms = pounds.

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