file Sparton

THOMPSON & KNIGHT
A PROFESSIONAL CORPORATION
ATTORNEYS AND COUNSELORS

1700 PACIFIC AVENUE • SUITE 3300
DALLAS, TEXAS 75201-4693
(214) 969-1700
FAX (214) 969-1751

AUSTIN
FORT WORTH
HOUSTON
MONTERREY, MEXICO

DIRECT DIAL:

(214) 969-1102

November 6, 1995

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Mr. Desi A. Crouther, Chief
Hazardous Waste Enforcement Branch
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Dear Mr. Crouther:

This letter is sent in response to your October 3, 1995, correspondence to Sparton Technology, Inc. ("Sparton") received on October 6, 1995. Attached to this letter are six (6) copies of a report reacting to responses EPA provided to certain issues raised by Sparton at a September 13, 1995, meeting, and proposing supplementation of the draft CMS report to address certain questions raised by EPA.

In general, and as our attached reaction to EPA's responses, to issues raised on September 13, 1995, sets forth, Sparton is very concerned that the threats to human health that EPA believes are posed by the groundwater impacted by Sparton's operation are unrealistic and not supported by objective information. Stated as plainly as possible, the impacted groundwater in the vicinity of the Sparton facility does not and will not threaten the quality of public water supply wells, nor is there any reasonable likelihood that the area of impacted groundwater will be used for private drinking water wells.

As discussed in the attached reaction of Sparton, any expansion of impacted groundwater is at a very slow rate and caused by diffusion, the mass of constituents of concern is decreasing, the concentration of those constituents will have been reduced to appropriate levels through natural attenuation before there could be any impact on public water supply wells, and existing institutional controls will prevent private wells from tapping into impacted groundwater before restoration is achieved.

We believe that the attached information effectively addresses any concerns that EPA may have about Sparton's proposed remedy. We are very interested in arranging a meeting in the near future to discuss the technical arguments included in the attached report.

Please make this letter and its attachment part of the administrative record.

Yours very truly,

James B. Harris

JBH/eshd
Enclosure

cc (w/enclosures): Groundwater and Hazardous Waste Bureau
New Mexico Environmental Improvement Division
New Mexico Health and Environment Department
1190 St. Francis Drive
P.O. Box 968
Santa Fe, NM 87504-0968

Mr. Richard D. Mico
Vice President and General Manager
Sparton Technology, Inc.
4901 Rockaway Blvd., SE
Rio Rancho, NM 87124

R. Jan Appel, Esq.
Vice President, General Counsel
Sparton Corporation
2400 E. Ganson Street
Jackson, MI 49202

Mr. Pierce L. Chandler Jr., P.E.
Project Manager
Black & Veatch
5728 LBJ Freeway
Suite 300
Dallas, Texas 75240

Mr. Jon F. DeWitt
Varnum, Riddering, Schmidt, & Howlett
171 Monroe Avenue, N.W.
Suite 800
Grand Rapids, MI 49503

Mr. Gray L. Richardson
Metric Corporation
8429 Washington Place, NE
Suite A
Albuquerque, NM 87109

Ms. Barbara Hoditschek
Permits Program Manager
New Mexico Hazardous & Radioactive Materials Bureau
2044 Galisteo
P.O. Box 26110
Santa Fe, NM 87502

Ms. Terry Sikes
Hazardous Waste Team
U. S. Environmental Protection Agency
Region 6, Mail Code 6EN-LH
1445 Ross Avenue
Dallas, TX 75202

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SPARTON'S REACTION TO THE RESPONSES OF EPA TO ISSUES DISCUSSED AT THE SEPTEMBER 13, 1995 MEETING, AND SPARTON'S RESPONSES TO EPA'S REQUEST FOR SUPPLEMENTATION OF THE DRAFT CMS

A. BACKGROUND

By letter dated October 3, 1995, received by Sparton on October 6, 1995, EPA responded to issues raised by Sparton at a September 13, 1995, meeting, and requested supplementation of the draft CMS report, with the understanding that EPA might have more comments in the future. EPA's responses to the issues raised by Sparton at the September 13, 1995, meeting, have been extremely helpful in identifying why the parties have basic disagreements about the threats presented by groundwater impacted by Sparton's operations. A party's perception of these threats is outcome determinative, in the sense that if certain threats do not exist particular types of remediation are not required. The first part of this report addresses why EPA has misidentified the threats presented by the Sparton Plume. The thrust of Sparton's reaction is that EPA has misunderstood the potential uses for the impacted groundwater and has reached conclusions about plume expansion that are inconsistent with the physical data. A correct understanding of both issues radically changes the threats presented by the impacted groundwater, and, therefore, what remediation is necessary.

This report also discusses the comments made by EPA on the draft CMS. Given that EPA has said further comments will arise in the future, Sparton is not formally modifying the draft CMS at this point. Instead, its proposed changes are included in this document. Once all comments from EPA are received, these changes, along with any others, will be incorporated into a final document for submission to EPA.

B. SPARTON'S REACTION TO EPA'S RESPONSES TO ISSUES RAISED DURING THE SEPTEMBER 13, 1995 MEETING.

1. Introduction.

The responses of EPA to the issues raised by Sparton at the September 13, 1995, meeting, makes clear that the only two threats to human health EPA believes are posed by the groundwater impacted by Sparton's operations are:

— most likely pathways to a receptor

a. Capture of that groundwater by a public water supply well; and

b. Completion of private drinking water wells into the impacted groundwater.

To eliminate the first threat, EPA identifies as an objective preventing further movement of the constituents impacting the groundwater. To deal with the second threat, EPA has identified as an objective restoration of the groundwater to its non-impacted

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HAZARDOUS WASTE COMPLIANCE
ENFORCEMENT SECTION

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Diffusion = ST's argument
① GW flow assumed by ST to be to SW of DG area
② essentially no-migration if diffusion dominate

condition, apparently through some type of pump and treat remedy, coupled with removal of any sources of constituents of concern in the non-saturated zone.

No such thing as no risk

As discussed in more detail below, there is simply no risk that the groundwater impacted by Sparton's operations will be captured by a public water supply well, based on existing information about contaminant movement. Therefore, it is unnecessary to prevent further migration, because the movement that is occurring does not present a threat to any public water supply well. Additionally, as discussed below, even if the identified objective was necessary to deal with a real threat, neither a pump and treat remedy nor soil vapor extraction would completely prevent migration.

Whose information (diffusion is probably only a secondary process)

True, but they would impact such contamination from spreading at the rate they presently have.

Also discussed below is the fact that there is no reasonable likelihood that groundwater impacted by Sparton's operations would supply private drinking water wells. At the current time, there is no residential development in the area, so there is no reason for completion of drinking water wells. If and when such development occurs, water will be supplied by municipal systems that do not rely upon the impacted groundwater. To the extent that someone wanted to complete a private drinking water well in the Sparton Plume, notwithstanding the municipal supply, state authorization would be required and current regulations prohibit completion of a well in the plume. Finally, even if a well was improperly completed, any potential threat could be addressed by treatment at the wellhead.

Convoluted argument

RCRA not directly concerned! (whether drinking water well or not)

who would want to tap into contaminated aquifer

this would be novel

2. **EPA is mistaken about the value and use of the groundwater impacted by Sparton's operations.**

a. In the Albuquerque area the sole-source of drinking water is not a regional aquifer.

However, the aquifer is currently being mined and reduced a rate of approximately 1 ft./yr.

In the definitive water resource study for the area, Albuquerque Water Resources Management Strategy, San Juan - Chama Diversion Project Options, July 1995 (City of Albuquerque, 1995, hereinafter, "Water Management Options Study") the Executive Summary concludes "[l]ocal groundwater is not viable as a sole source of supply" (p. 5). One of the three strategic concerns of the city is that "[c]ontinued use of the local aquifer as the sole source of drinking water is not prudent" (p. 1-15). The report points out that continued use of groundwater is more costly than other options, relies on depletion of the aquifer for over half of the city's supply, may require arsenic removal, and could result in major subsidence of the surface and related infrastructure.

b. Public water supply wells are not threatened by the Sparton Plume.

There are no public water supply wells within two miles of the Sparton Plume. The nearest water supply well is over two miles from the plume, as correctly stated in the EPA-approved RFI Report and in the draft CMS Report. At the current extremely low rate of diffusion of contaminants in the plume, it would

DIFFUSION

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take over a hundred years to reach these wells. Of course, such diffusion will not continue indefinitely. Even if it did, by the time constituents of concern in the Sparton Plume reached the nearest public water supply well, they would be at such a low concentration that the public water supply well would be unimpacted.

Basically, ST depending upon dilution as a "solution"

c. <u>No public water supply wells are planned for development within two miles of the Sparton Plume</u>.

Although most all of the plume area is within and surrounded by the City of Albuquerque, the Sparton facility is well outside any of the designated Water Management Options Study service areas (Albuquerque, 1995, p. B-5 attached), and outside areas of proposed city well installation. In fact, the Water Management Options Study indicates that <u>no</u> public water supply wells will be developed in the Sparton area through the year 2060. (Albuquerque, 1995, Appendix C).

the ST contam would probably preclude development of a water supply well

The New Mexico State Engineer's Office (SEO) must approve each new public water supply well. All recent city well applications have been protested (Albuquerque, 1995, p.6), and none have been granted.

An SEO task force has made recommendations, which if adopted would effectively halt all new drilling for public water supply wells in the Albuquerque area. (Albuquerque, 1995, p.6). The task force recommendations are consistent with studies by the city and the U.S. Geological Survey that have resulted in revisions to previous views on the hydrology of the regional aquifer serving the greater Albuquerque area -- particularly on the west side of the Rio Grande.

Experimental drilling has demonstrated "that areas of highly productive aquifer are scarce west of the river" (Albuquerque, 1995, p. 1-7). Graphically, the change in understanding of the aquifer is shown on the attached Figure 1-4 from the 1995 Report. These latest studies confirm that about half of the city's water supply relies on depletion or "mining" of the aquifer (Albuquerque, 1995, p. 3-23, 5-1), almost twice as much as previously estimated.

The Water Management Options Study concludes that "continued mining will increase the cost of wells and pumping, degrade the quality of water, and impose risk of land subsidence." (Albuquerque, 1995, p. 6) Heavy pumping has already caused some wells to experience large declines in water levels. The effects of regional aquifer mining are graphically depicted on the attached Figure 1-5 from the Water Management Options Study.

The SEO is also considering establishing Critical Management Areas (CMAs) where drawdown has been significant. These CMAs, if established, would almost certainly prevent well development west of the Rio Grande (and particularly in the

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Sparton facility area), because the USGS models show the greatest water level declines on the west side of the river (Albuquerque, 1995, Appendix C).

An additional reason for less development of groundwater in the Sparton area is that water quality on the west side of the Rio Grande is of a lesser quality than other areas providing water for Albuquerque. This poor water quality is associated both with decreased yield and the presence of volcanic intrusions. A specific example is increasing arsenic concentrations on the west side of the river with greater distance from the Rio Grande (Albuquerque, 1995, p. C-56, 57, 58).

Based on the Water Management Options Study and the current thinking of the SEO, if new public water supply wells are completed at all, they will be "somewhere near the river where a good hydrologic connection between the river and the aquifer exists" (Albuquerque, 1995, p. B-46), not near the Sparton facility. A graphic depiction is given on the attached Figure B-13 (Albuquerque, 1995, p. B-49).

In short, Albuquerque is moving away, in general, from use of groundwater for its additional water supply. Those areas considered for even limited additional development of groundwater are distinct from and far upgradient of the area impacted by Sparton's operations.

d. Alternative existing renewable water resources are already available to the city.

The city currently holds a federal contract to receive 48,200 acre-feet annually from the San Juan-Chama Diversion Project. The water has been delivered into the Rio Grande basin since 1971. "The city owns this water, the project is largely paid for, it is a firm supply, and the water can be delivered to the city at essentially no extra cost." (Albuquerque, 1995, p. 6).

Originally, it was believed that the Rio Grande recharged the aquifer and the San Juan-Chama (SJC) water resupplied the Rio Grande. The latest studies have proven this understanding wrong. "To justify the investment city ratepayers have made and to better secure its claim to SJC water, the city must find a way to use its share of the SJC water for water supply. If it is released to the Rio Grande to offset a fictional depletion of the river, it is not used, it is lost." (Albuquerque, 1995, p. 1-13). For these reasons the city is moving to direct use of Rio Grande water in lieu of further mining of groundwater.

The city is also moving forward on water conservation. "The first step in this policy is an aggressive program of water conservation, which has as a target reducing water use on a per person basis by 30 percent in 10 years." (Albuquerque, 1995, p. 1-14).

Conservation is not driven by pollution in the aquifer

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The Water Management Options Study acknowledges that use of the SJC supply, together with conservation, would eliminate mining of the regional aquifer through the year 2035. (Albuquerque, 1995, p. 9).

Treated wastewater effluent is another alternative source. The Isleta Pueblo downstream of the city has proposed stringent water quality standards (under the Clean Water Act) for the Rio Grande. The city, pueblo, state, and EPA are studying whether these standards can be attained in the Rio Grande. Depending on the results of the study, substantial water treatment would be required to meet the proposed water quality standards. "If the city is required to treat effluent to near potable standards to comply with the Clean Water Act, alternative uses of the treated effluent could become a viable option." (Albuquerque, 1995, p. B-14, B-15). The city estimates that use of treated effluent would provide sufficient water, in conjunction with SJC use, and conservation, to provide sufficient water through the year 2060, without mining of the regional aquifer.

c. The Sparton Plume is **not** a crucial source of drinking water.

Contrary to EPA's understanding, the Water Management Options Study does not identify the area where the Sparton Plume is located as crucial for groundwater quality protection. In fact, that study makes clear the city is moving away from use of groundwater for additional drinking water supply. Regardless of how quickly that change occurs, the city does not intend to use the area where the Sparton Plume exists as a source of public water. An earlier study, referenced by EPA, does suggest the Sparton Plume is in a "crucial area," but then according to that report there is very little ground in the vicinity of Albuquerque that is not "crucial." The vast expanse of what is thought "crucial" stems from the broad definition of that term adopted in the study. For example, groundwater in a setting that allows "rapid movement" (undefined) of contaminants is crucial, even if the groundwater will never be used as a drinking water source. Under a more thoughtful definition, the Sparton Plume would not be considered as located in a "crucial" area, a conclusion recognized by the Water Management Options Study.

3. **EPA's perception of the importance of the Sparton Plume as a drinking water resource overlooks significant concentrations of naturally occurring arsenic.**

The mean concentration of arsenic in all the groundwater pumped by the city's wells exceeds 15 μg/l. Over three fourths of the city's 92 existing wells produce water with arsenic concentrations exceeding 5 μg/l. Further, recent analyses suggest arsenic concentrations may be increasing in some city wells.

Sampling and analysis results reported in the EPA-approved RFI Report for water in the Sparton Plume are in the range of the city results. Those findings are consistent with

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no greater than 8 µg/L in 7/9 sampling event

Is there (Do data support this contention?)

extrapolation of city data that suggest there should be an arsenic problem in the area where the Sparton Plume is located. For instance, the highest concentrations of arsenic in city wells (over 50 µg/l) occur on the west side of the Rio Grande as shown on the attached Figure C-38 (Albuquerque, 1995, p. C-57). These concentrations have caused two wells west of the river to be taken out of service. (Albuquerque, 1995, p. B-27)

Although the current MCL for arsenic is 50 µg/l, there is considerable pressure on EPA to lower this standard to the 5 to 10 µg/l range. Recently, the Natural Resources Defense Council (NRDC) started a campaign to lower the MCL for arsenic on the basis that it is a "known human carcinogen," and because available risk data suggest a lower MCL is appropriate (NRDC, 1995).

The 1995 Water Management Options Study concludes that "arsenic is a pervasive problem in the aquifer and that treatment to remove arsenic will be very expensive." (Albuquerque, 1995, p. 1-11). "Facilities to remove arsenic from groundwater could cost from $90 million to over $400 million through 2035, depending on the standard..." (Albuquerque, 1995, p. 9). O&M annual costs would be in the order of $1 million. Cost of arsenic treatment has been factored into all of the management strategy options.

Interestingly, none of the city management strategies involve hydraulic containment for arsenic, even though "concentrations appear to vary greatly over very short distances." (Albuquerque, 1995 p. C-56).

The city understands that future use of groundwater will require treatment to remove arsenic. Because of the distributed nature of the groundwater system, "treatment of arsenic at a conventional, centralized water treatment plant becomes problematic and would perhaps be prohibitive when the additional infrastructure is added. Preliminary analyses suggest that it may be more economical to use smaller treatment facilities located at the reservoir sites." (Albuquerque, 1995, p. B-27).

As = naturally occurring
TCE, etc. caused by SP.

If the city can commit to well field (wellhead, essentially) treatment to remove arsenic, the obvious question is why can't similar logic be applied to TCE in the unlikely event that the Sparton Plume is ever used as a drinking water supply, before restoration is achieved.

As = one element
TCE, Cr, etc = several elements

Wellhead treatment of produced water to remove TCE is easier, simpler, safer, and cheaper than arsenic treatment. Further, TCE treatment does not produce a hazardous waste (arsenic water treatment sludge).

what about As, & other haz. constituents?

The Sparton Plume area will not be used for groundwater production based on the Water Management Options Study; however, if the area is included in some future water plan, the presence of TCE should not be a greater impairment than arsenic to its productive use, because of the existence of wellhead treatment.

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4. **EPA has overlooked institutional controls that should prevent the completion of drinking water wells in the Sparton Plume.**

In New Mexico neither a public nor private groundwater well can be drilled or completed without a permit from the state. N.M. Stat. Ann. § 72-12-1. As Albuquerque's recent experience has shown, the time for processing of those applications can be lengthy. Moreover, public and private wells for drinking water cannot be located closer than 100 feet horizontally to any pollution source. 20 NMAC 7.1 Subpart I § 109(C)(1)-(2). Based on these institutional constraints, no drinking water wells should be installed in the Sparton Plume, contrary to EPA's apparent perception.

this states therefore the need to complete wonderful consistent logic

5. **By misunderstanding available data, EPA incorrectly calculated the rate of plume movement and mistakenly concluded the dominant transport mechanism is advection.**

EPA appears to have incorrectly treated the subsurface conditions in the vicinity of the Sparton facility as homogeneous and isotropic in determining the rate of movement of the plume to be between 100 and 380 feet per year (ft/yr). These rates were based on the distance from the source (solvent sump/ evaporation ponds) to the leading edge (<5μg/l) of the plume and on the difference between the leading edge of the plume in 1991 and the fourth quarter (4Q) 1993 sampling event. Additional samples were taken in 4Q 1994, but only a limited nonrepresentative sample of the existing monitoring wells.

In a worst case scenario, which is what the fourth quarter (4Q) groundwater contouring was supposed to represent, the plume has moved about 2500 feet from the source area. When contaminants first reached the groundwater is not completely clear. But even conservative assumptions result in the average rate of movement being much lower than EPA's highest flow rate. However, a closer examination of site conditions indicates that more recent movement may be slower then any long term average.

Groundwater velocity calculations are based on the formula V_a=Ki/n. V_a is the flow, K is the hydraulic conductivity of the aquifer, i is the hydraulic gradient, which describes the speed of the flow, and n is the porosity of the saturated media. K and n, which remain constant for the aquifer, are identified in the EPA-approved RFI Report.

Water level data from the EPA-approved RFI Report and subsequent sampling events indicate that the gradient at the Sparton facility is 3 to 10 times greater than that observed off-site. Therefore, the plume would have moved faster under the Sparton facility, and then slowed down off-site. This analysis also fits with other data suggesting that the plume is currently moving primarily by means of diffusion and not advection.

EPA, nevertheless, contends that the groundwater velocity is increasing off-site. EPA calculated groundwater velocity of 12 to 18 ft/yr on site, 39 to 94 ft/yr at the western end of

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the plume, and 56 to 134 ft/yr in the vicinity of MW-61. That conclusion is inconsistent with the physical characteristics of the subsurface at and near the Sparton facility.

The EPA-approved RFI Report describes K as 21.4 to 31.2 ft/day and n as 0.25 to 0.40. The 4Q 1993 data support the ranges assigned to K and n. The variable i is calculated from water level contours, described in the EPA-approved RFI and confirmed by 4Q 1993 data. That number is different on-site, toward the leading edge of the plume from wells MW-48 to MW-52, and in the vicinity of well MW-61 [RFI Fig. 25 (1991) and Fig. 94 (1994)]. Inserting this data in the appropriate formula establishes the following velocities:

On Site:
K = 21.4 to 31.2 ft/day
i = 0.01
n = 0.25 to 0.40
V_a = 195 to 456 ft/yr (versus EPA's 12 to 18 ft/yr)

West end of plume:
K = 21.4 to 31.2 ft/day
i = 0.002
n = 0.25 to 0.04
V_a = 39 to 94 ft/yr (same as EPA calculated)

Area near MW-61:
K = 21.4 to 31.2 ft/day
i = 0.001
n = 0.25 to 0.04
V_a = 20 to 47 ft/yr (versus EPA's 56 to 134 ft/yr)

Therefore, the groundwater velocity shows that the flow rates do not increase off-site, but in fact significantly decrease. Moreover, these flow rates strongly suggest diffusion is the primary method of plume movement. ? ☆ Diffusion ↑

The contaminant concentration data from the EPA-approved RFI Report illustrates the downgradient reduction of the advective component and the larger influence of diffusion in plume development. The plume dimension—length (L) to width (W)—ratios are characteristic of a diffusion dominated plume (RFI Figs. 55, 57, and 59). The TCE concentration contouring indicates L to W ratios for the various flow zones are as follows:

See next page, top

Upper Flow Zone (UFZ)	L to W = 2.2:1
Upper Lower Flow Zone (ULFZ)	L to W = 1.9:1
Lower Lower Flow Zone (LLFZ)	L to W = 3.3:1

The L to W ratios based on the 4Q 1993 data are as follows:

Upper Flow Zone (UFZ)	L to W = 2.8:1

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Upper Lower Flow Zone (ULFZ)	L to W = 2.1:1
Lower Lower Flow Zone (LLFZ)	L to W = 3.8:1

DIFFUSI

All of these ratios are well below the typical advection-dominant threshold of 10:1 L to W, and are close to approaching a diffusion-only ratio of 1:1.

Another confirmation of the movement by diffusion is the fact that UFZ wells MW-48, MW-58, and MW-52, which line up in the implied flow direction at the leading edge of the plume, show a logarithmic dropoff in TCE concentration. This characteristic is found in diffusion-dominated transport. Finally,contaminants have been detected in wells that are hydraulically upgradient of the source. Again, this type of movement is characteristic of diffusion.

check

Sparton is surprised EPA is now even suggesting that the plume is not diffusion dominated. The RFI report, which EPA approved and accepted, explained in detail why the Sparton Plume's movement is through diffusion. EPA has never before challenged that conclusion. Moreover, as discussed above, recent analytical data further supports that plume movement is diffusion dominated.

6. **EPA has incorrectly refused to accept that constituent concentration and constituent mass associated with the plume have substantially decreased since off-site sampling began in 1989.**

EPA attempts to support its position that natural attenuation is not occurring in the plume by presenting data from eight monitoring wells sampled in the fourth quarter (4Q) 1993. The 4Q 1993 sampling results are based on groundwater analyses from 42 of the 43 wells used in the last EPA-approved RFI data base (June 1991). EPA does not discuss the results of the other 34 monitoring wells and the interrelationship of those results with the 8 wells showing increased concentrations. Of the 42 wells sampled, 8 have increased concentrations, 17 have decreased concentrations, and 17 have stable concentrations. Stated slightly differently, 19 percent of the sampled wells showed an increase while 81 percent showed a decrease or remained nearly the same.

If the wells are analyzed by their vertical location (UFZ, ULFZ, and LLFZ), the actual analysis of the plume becomes even more clear. The 4Q 1993 sampling results in the UFZ, show 3 (14%) wells increased, 9 (43%) decreased, and 9 (43%) stayed approximately the same. In the ULFZ, 3 (23%) increased, 6 (46%) decreased, and 4 (31%) stayed approximately the same. In the LLFZ, 2 (25%) increased, 2 (25%) decreased, and 4 (50%) stayed approximately the same.

Dilution + movement

Additionally, the vertical trends of contaminant concentrations within well clusters have remained unchanged. In the EPA-approved RFI Report, only a single well cluster (No. 4) on the property's west side showed an increasing contaminant concentration trend with depth. The remaining clusters showed decreasing trends with depth. In the 4Q 1993

Any evidence of natural attenuation as dominant mechanism? → What are degradation products? How does this affect metals

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sampling, cluster No. 4 again showed an increase with depth; however, it should be noted that LLFZ well MW-32 in this cluster has been extremely erratic and the subject of additional study. Also, in 1993, cluster No. 9 showed a fairly uniform distribution with depth compared to a decreasing trend in the EPA-approved RFI data. The remaining eight clusters (80 percent of the clusters; 77 percent of the cluster wells) showed decreasing concentrations with depth.

EPA's refusal to agree that constituent mass is decreasing appears premised on selective use of RFI data. EPA approved the 1991 horizontal and vertical contouring of the TCE concentrations in the RFI Report. The agency used that horizontal contouring of the 1991 data to compare to the 1993 data to calculate a rate of plume movement. The TCE mass and concentration reduction calculations submitted to EPA as part of the revision to the Effectiveness Report for the Interim Measures showed, based on 4Q 1993 analytical results, that the TCE mass decreased by 53 percent, and the average TCE concentration decreased 56 percent. EPA's argument for discontinuing those results was the purported existence of "an unknown mass of contaminants outside of the existing monitoring well network (both horizontal and vertical)." Yet Sparton's calculations were based on the very same contouring data EPA used to determine the plume's rate of movement.

EPA cannot have its cake and eat it too. EPA specified the locations and depths for the off-site monitoring wells, and the depths are in accordance with prevailing guidance (wells screened across the water table). Additionally, even with the decreased off-site monitoring density, very good definition of geologic and hydrogeologic conditions and contamination gradients (both horizontal and vertical) exists on-site. The existing well pattern provides a scientifically valid base on which to interpolate/extrapolate concentrations of constituents of concern in the off-site areas.

Further confirmation of contaminant mass reduction is shown by the results of soil gas studies conducted in 1984, 1987, and 1990 and reported in the EPA-approved RFI Report. The soil gas results show a significant decrease in soil gas contaminant concentration over this time period. The soil gas information is particularly relevant to confirming dissolved-phase groundwater contamination decrease. It should be noted that the Sparton facility was highlighted in the EPA Seminar Publication, Corrective Action: Technologies and Applications (EPA, 1989) in the discussion of applying soil gas monitoring to groundwater investigation.

A review of the above data indicates that the amount of contamination has decreased and has not moved vertically to any great extent. More than four times as many wells have shown a decrease or no change in contaminant concentrations as an increase. The data do not suggest a plume that is rapidly expanding due to an advective component, but instead contaminant movement within a relatively stabilized, diffusion-dominated plume.

not supported by data at off-site wells 48, 55, 56 & 60, 61

Moreover this data is consistent with various studies that have confirmed that a variety of natural processes.

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7. **There is no current information suggesting use of soil vapor extraction will be cost-effective.**

need borings to determine if still a source (+ possible active soil gas sampling) & then pilot test

EPA apparently believes that significant quantities of source material remain in the soil impacted by Sparton's operations, which can be removed by soil vapor extraction. There is no current information to support this perception. — but there are older data which support this.

To determine if soil vapor extraction is cost effective, 7 off-site and 10 on-site wells should be sampled to determine the gas transmissivity of the deep subsurface soils immediately above the water table and the presence of elevated TCE concentration in the soil gas immediately above the water table. If the soil gas concentrations are in the range predicted by equilibrium using Henry's Law (gas concentration (ppb) ≈ 70 times groundwater concentration (μg/l)), then dissolution from groundwater can readily be assumed. Nevertheless, only if the deep subsurface soils are also gas transmissive, should VES be considered to reduce groundwater concentration in the UFZ. Whether such conditions exist should be determined before any proper analysis of the benefits of soil vapor extraction can be made.

8. **EPA has exaggerated the potential threat to human health, and misidentified potential exposure pathways.**

Although over 3 years have elapsed since EPA approved the RFI Report, conclusions on potential receptors and exposure pathways have not changed. Groundwater is still the only potential exposure pathway; however, the nearest downgradient municipal/domestic supply well is over two miles from the leading edge of the plume. As already noted, public water supply wells will not be completed in the plume area through the year 2060. In addition, private wells cannot be drilled in or near the plume. does NMED accept this (??)

Current zoning and development to date suggest a continuation of past patterns. Population density/use is increasing in the area as development proceeds; however, population increase does not translate to more potential receptors because the entire area is on municipal water supply produced from wells no nearer than two miles northwest of the facility.

The current rate of plume movement and contaminant concentration also indicate no potential change in threat or risk. Based on current plume movement and the estimated influence zone of the existing New Mexico Utility wells over 2 miles west northwest of the leading edge of the plume, it will take over a hundred years for the plume to reach these wells. By that time the concentration of constituents of concern would be so low that no risk would exist.

9. **Any pump and treat remedy may be "technically impracticable".**

In September 1993, EPA published OSWER Directive 9234.2-25 Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration (EPA, 1993a). In the letter transmitting the guidance to the various EPA regions, EPA admits that "experience over

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the past decade has shown that achieving the required final cleanup standards may not be practicable at some sites due to the limitations of remediation technology." (EPA, 1993b). The transmitting letter further states, "[t]he technical challenges to remediating contaminated groundwater include many complex factors related to site hydrogeology and chemistry. One of the most difficult of these challenges is the problem presented by DNAPL (dense, nonaqueous phase liquid) contamination. DNAPLs include such diverse organic compounds as chlorinated solvents, PCBs, creosote, and certain pesticides. These compounds, which a recent EPA study indicates may be present as DNAPLs at up to 60 percent of NPL sites, are often very difficult to locate and remove from the subsurface environment and may continue to contaminate groundwater for many hundreds of years despite best efforts to remediate them. The prevalence and intractability of DNAPL contamination are among the principal reasons this guidance was developed by EPA." (EPA, 1993b) (emphasis added).

Guidance does not preclude ① characterizing & remediation dissolved phase of plumes + ② containing source(s)

There are a number of factors that can inhibit groundwater restoration. In the guidance, there is a convenient chart, Figure 1, summarizing contaminant and hydrogeologic factors affecting groundwater restoration (EPA, 1993a). Using a similar format, site-specific information for the Sparton facility taken from the EPA-approved RFI Report has been used to generally demonstrate remediation difficulty:

Contaminant/ Hydrogeologic Factors	Sparton's Conditions	Sparton Remediation Difficulty
Nature of release	Long duration	High
Biotic/abiotic decay potential	Moderate	Moderate
Volatility	Moderate	Moderate
Retardation (sorption) potential	High	High
Contaminant phase	Aqueous, gaseous, sorbed	Moderate to High
Volume of contaminated media	Relatively large	High
Contamination depth	Relatively deep	High
Stratigraphy	Complex geology, interbedded and discontinuous	High
Texture of deposits	Ranges from gravelly sand to silts and clays	Moderate to High
Degree of Heterogeneity	Heterogeneous-interbedded and discontinuous	High
Hydraulic conductivity	High ($\approx 10^2$cm/sec) in most conductive zones	Low

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Contaminant/ Hydrogeologic Factors	Sparton's Conditions	Sparton Remediation Difficulty
Temporal variation	Slight change in water elevation/ gradient	Low to Moderate
Vertical flow	Little	Low

This table demonstrates that any groundwater restoration will be very difficult regardless of remediation method/approach used.

But there are more fundamental reasons a pump and treat remedy will not work -- it will have little impact on migration, and it will not fundamentally speed up restoration of water quality to drinking water standards.

I do not understand the rationale for this statement, regardless of the "drivers" for contam. migration

The aquifer under the Sparton facility is a remarkably heterogeneous, horizontally layered system ranging from gravelly sands to silts and clays. As pointed out in the EPA-approved RFI Report and draft CMS Report, maximum contaminant concentrations occur in the uppermost zone of the aquifer with preferential transport occurring in the cleaner, gravelly "channels" and sorption occurring in the silt and clay layers. Horizontal plume dimensions are approximately 3,000 ft by 1,500 ft. Contamination extends approximately 100 ft vertically downward into the aquifer.

Aquifer parameters would indicate that two to three wells and their corresponding influence or capture zones would adequately cover the plume area; however, achieving containment is not that simple. Because the greatest contamination occurs in the UFZ, near the surface of the aquifer, deeper wells to contain the entire plume would result in contamination being pulled downward into lower, less contaminated zones of the aquifer. Thus, containment can only be attempted in the UFZ. Further, installation of extraction wells off-site used for containment could actually induce the highest contaminant concentrations upgradient to move off-site due to increased hydraulic gradient.

In addition, containment as a goal implies that extraction wells will be pumped continuously instead of "pulse-pumped" as needed for aquifer restoration. The basis for "pulse-pumping" is well documented in technical literature and significant detail was provided in the draft CMS Report. Pulse pumping provides greater efficiency in aquifer restoration by allowing sufficient time for dissolved-phase contaminants to diffuse out of less permeable zones and for sorbed contaminants to reach equilibrium concentration with groundwater prior to removal for surface treatment. Continuous pumping will remove dissolved phase contamination initially but, with time, "bypassing" of relatively uncontaminated water will occur through the most transmissive zones leaving significant amounts of contaminants unaffected. Thus, containment and restoration are in opposition. In addition, pursuing a containment option will result in significant increases in the quantity of produced water as

Containment is not Restoration

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well as extending the time frame to achieve aquifer restoration. It is questionable whether such heavy "mining" of the aquifer to attempt partial containment is really a valid approach. At the anticipated pumping rate, three extraction wells would mine 864,000 gallons/day (2.65 acre-feet/day) or 315 million gallons/year (968 acre-feet/year) for a multi-year period. This corresponds to an equivalent population water use of 3,456 to 4,320 people (250-200 gallons/person/day) identified in the various city planning documents. This is about one percent of the total groundwater currently pumped by the city.

Even if the noted obstacles to containment could be overcome, containment based on extraction wells will be very limited in effectiveness with respect to a diffusion-dominated plume. Extraction well containment focuses primarily on advection processes; however, as already discussed advection is not a dominant process in the Sparton Plume.

Finally, even if these technical difficulties could be overcome, EPA has not established that restoration will occur in a significantly faster time period through a pump and treat remedy then if Sparton's remedy is implemented. Sparton strongly suspects that if EPA rigorously analyzed the restoration potential of a pump and treat remedy, it would find that achieving "cleanup" is not meaningfully quicker than through Sparton's remedy; but the cost of "pump and treat" is much greater. Unfortunately, EPA has yet to undertake any systematic evaluation of a pump and treat remedy. For instance there is no meaningful data on whether it will work, *e.g.*, achieve MCL's, if it does, how long it will take to succeed, or its costs. Nor has EPA even indicated if it intends to use continuous or pulse pumping. As already outlined, chances of success appear slim, will require a long time, and cost a great deal of money. Stated plainly, while a pump and treat remedy, if properly designed and operated might slightly increase containment, at least in the UFZ, it will not significantly speed restoration. Even a limited cost-benefit analysis would show a pump and treat remedy is not appropriate at this site.

C. SPARTON'S RESPONSE TO EPA'S REQUEST FOR SUPPLEMENTATION OF THE DRAFT CMS.

1. Introduction.

The following constitutes Sparton's response to EPA's preliminary comments on the draft CMS. These proposed changes will be incorporated in the final CMS when all comments have been received from EPA.

2. Referencing Technical Information.

The stated request of EPA in its October 3, 1995, letter for "references for the technical information presented in the CMS Report," was confusing in light of the 77 references that were included in the bibliography of the draft CMS Report. Based on a subsequent conversation with Vince Mallott of EPA about the meaning of the request, it was our understanding that EPA wanted to tie the listed references to a particular remedial methodology to assist the public in reviewing the CMS Report, and to be able to verify

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information contained in the CMS Report. To that end, we would propose revising the current bibliography by subdividing it into subsections based on reference to a particular technology/ methodology. In addition, we would propose adding language to Chapter VI, Identification of the Corrective Measure Alternative or Alternatives (under Section A General) and to Chapter VII Evaluation of the Corrective Measure Alternative or Alternatives (under Section A General) stating that:

> "Further information on technology/ methodology discussed in this Chapter can be found in references listed under that specific heading in the Report's Bibliography. As a general reference of available technologies, the publication Remediation Technologies Screening Matrix and Reference Guide (EPA/USAF, 1993) has been appended to this Report.
>
> References to certain technologies being the "best available" or BAT is based on determinations made by EPA under the Safe Drinking Water (EPA 1985, 1987, 1988, 1990).
>
> Other information in this chapter is based on institutional knowledge, developed from other projects of the authors and their professional experience."

These proposed changes should allow the public an easy opportunity to evaluate and verify information contained in the CMS Report. Including the general reference in the Appendix to the CMS Report, also allows rapid access to additional information on all available technologies.

3. **Injection wells/surficial reuse.**

It is not clear where EPA wants this discussion included in the CMS. The content Sparton proposes is as follows:

> "Injection wells and/or surficial reuse of treated groundwater are potential alternative methods for dealing with groundwater produced by a pump and treat system. Although both methods allow some local beneficial use, as opposed to river discharge, there are significant technical and legal considerations affecting implementation.
>
> Both injection wells and infiltration galleries have been used at several sites in the South Valley area. However, these installations have experienced severe clogging and/or plugging problems due to calcium carbonate buildup and biologic growth. Encrustation and biofouling have quickly reduced the ability of these systems to inject treated water into the subsurface. With additional treatment, including extended storage, injection wells have performed better; however, some of the additional treatment such as chlorine

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disinfection has produced trihalomethanes and other chlorinated compounds. Further, treatment to remove encrusting chemicals may result in a hazardous sludge byproduct. This is particularly significant in the Sparton facility area where naturally occurring arsenic is present in the groundwater. Arsenic, for instance, is generally not a concern in the South Valley area.

Beneficial reuse requires some suitable site that can accept and use the water year round. In the absence of a potential user year round, the extraction system would either require seasonal suspension or alternative disposal. At the present time, there is no potential year round user for the treated water.

Legal issues related to injection wells and beneficial reuse include; potential liability for the creation of toxic conditions not present now from use of the recovered water, extensive, contested permitting processes, and the need to obtain easements.

Due to the combination of legal and technical difficulties associated with injection wells and reuse, direct discharge is still the most viable option. Discharge to the Rio Grande with a NPDES permit is much more straightforward and is the most practicable and lowest risk option for disposal of treated water. Moreover, discharge is not a loss of the water, but makes supply available for a non-local use."

4. **Hydraulic containment.**

In the existing draft CMS Report, extraction wells are discussed as a containment action under Chapter V. Screening of Corrective Measure Technologies. In Figure 20, extraction wells are discussed under: Groundwater and Containment. As discussed in the draft CMS Report, containment was not considered necessary or one of the corrective action objectives. A discussion of containment was included in the draft CMS Report because the Order specifically required evaluation of an Infiltration Gallery/Injection Well containment alternative.

Groundwater extraction is discussed in the draft CMS Report beginning on page 84. We would propose adding the following paragraphs to that section:

"Extraction wells cannot provide complete containment at this site. Because the bulk of the contamination mass is in the UFZ, extraction wells should not penetrate more than 30 to 35 feet into the aquifer to avoid pulling contamination down into lower portions of the aquifer. Further, extraction wells screened wholly within lower zones of the aquifer may cause similar problems. Thus, any containment provided by extraction wells would be limited to the UFZ.

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Bad argument

Moreover, the use of continuously pumped extraction wells in the UFZ for containment will have little success for two reasons -- diffusion-dominant contaminant movement and application in the UFZ only. Plume movement at this site is diffusion-dominated whereas hydraulic containment is based on controlling advection-dominant movement. Without wells below the UFZ, there would be no additional containment in those zones.

Continuous pumping of the extraction wells for containment reasons will result in significantly increased quantities of produced water as well as greatly extending the time frame to achieve source removal and aquifer restoration. In all probability, some or all of this produced water will be lost to local use. It is questionable whether heavy "mining" of the aquifer to achieve partial containment is really a valid approach. At the anticipated pumping rate, the extraction wells would mine 864,000 gallons/day (2.65 acre-feet/day) or 315 million gallons/year (968 acre-feet/year) for a multi-year period. This corresponds to an equivalent population water use of 3,456 to 4,320 people (250-200 gallons/ person/day).

However, the most efficient use of extraction wells for both source removal and aquifer restoration requires pulse pumping or intermittent pumping of the wells. Because pulse pumping results in periods of no pumping from the wells, containment would also be intermittent."

5. **Criteria for changes in development and plume characteristics.**

EPA comment 4 requested that specific criteria for evaluating changes in land use/development and groundwater monitoring be provided. It was unclear to Sparton to what portion of the draft CMS this comment was directed. As a result of subsequent discussions with EPA representatives, item 5 on page 123 was identified as the portion of the CMS that required supplementation. In that portion of the draft CMS, Sparton indicated it would periodically evaluate new off-site developments to determine whether there had been an increase in risk or threat requiring additional corrective measures study. The specific situation Sparton had in mind was the drilling and completion of public or private water supply wells. To make this point more clearly, Sparton proposes to replace the last two sentences of item 5 on page 123 with the following statements:

"Applications for permits to drill and complete private or public drinking water wells in groundwater impacted by Sparton's operations will be monitored. Notice will be given to the State Engineer's Office of the area impacted by Sparton's operations and that Sparton should be notified in the event that any

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applications are received for the drilling and completion of wells within that area. Sparton will on an annual basis update its description of the impacted area to take into consideration any expansion or contraction of the impacted groundwater. Sparton will participate in any permit proceedings, and to the extent a permit is granted that will allow a well to be drilled in the impacted area, Sparton will undertake an additional corrective measures study to determine what response is appropriate in order to address any threat that may be presented."

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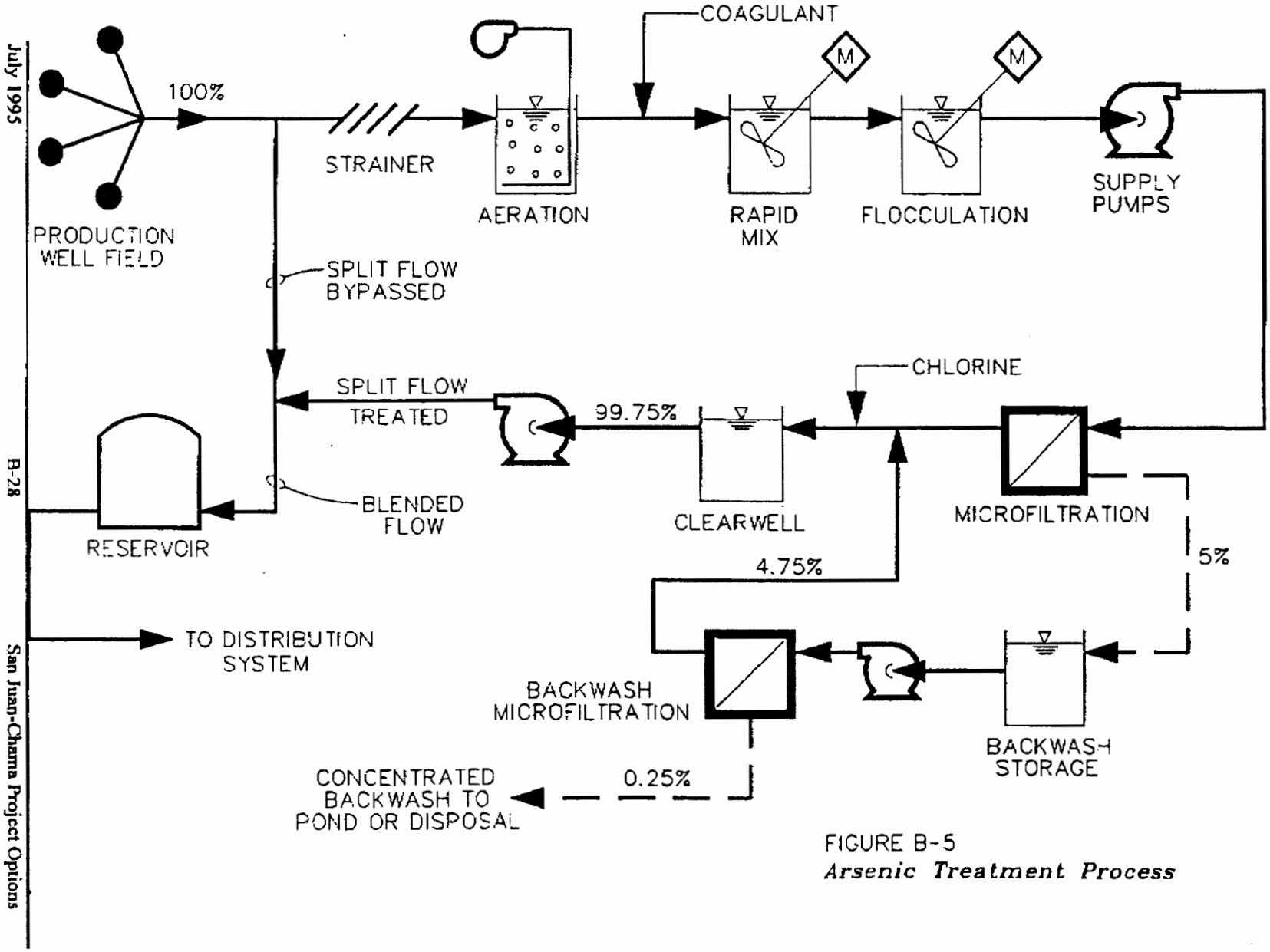

FIGURE B-5
Arsenic Treatment Process

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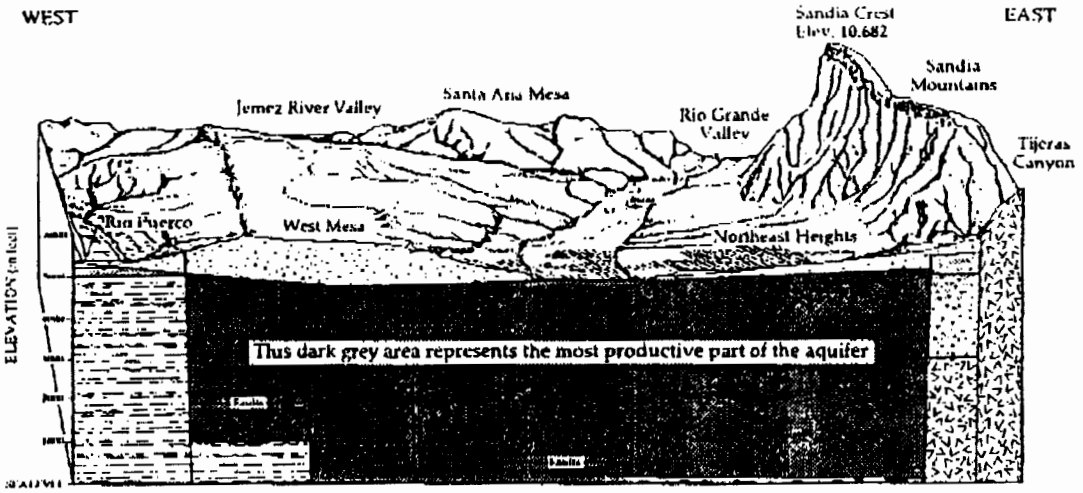
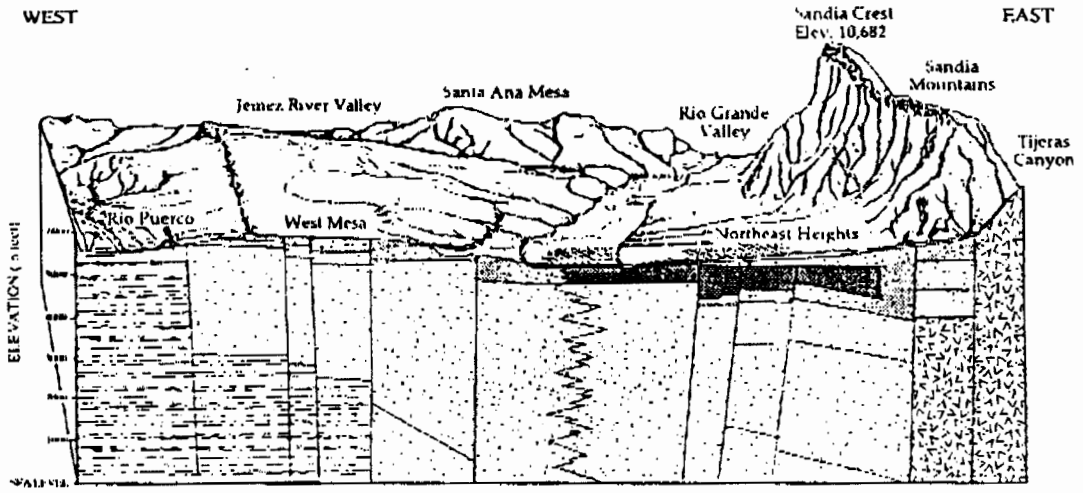


1950s Conceptual View of the Aquifer

This is a 1950s representation of what the aquifer looked like – the dark grey area represents the most productive part of the aquifer – in essence, everything under Albuquerque and the West Mesa.



1990s Conceptual View of the Aquifer

We now know that the productive dark grey area of aquifer is much less extensive than previously thought. The light grey areas also have water in them – however, the lighter the grey, the less productive these areas are.

Figure 1-4. The New Conceptual Model of the Aquifer.

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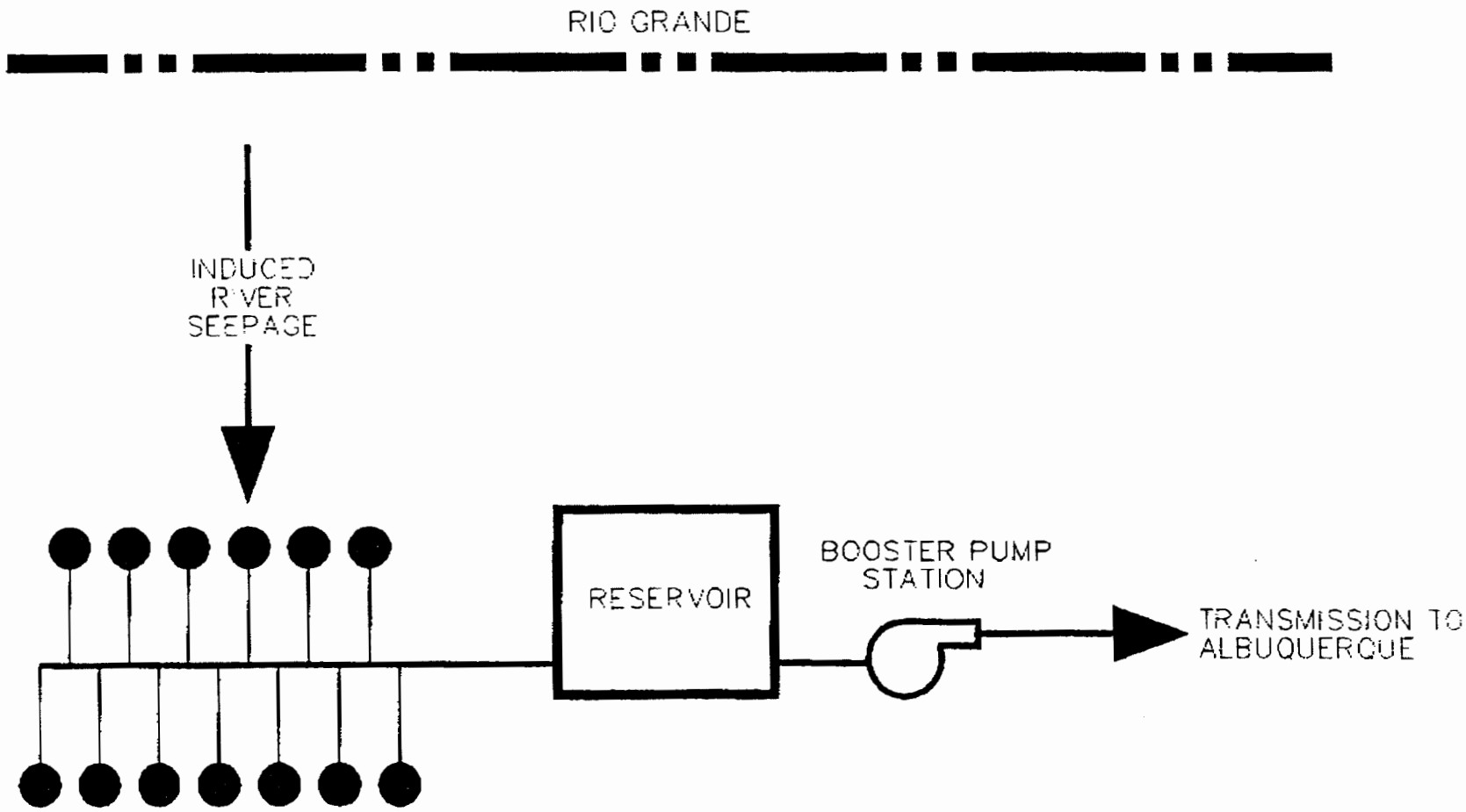

FIGURE B-13
Conceptual Wellfield

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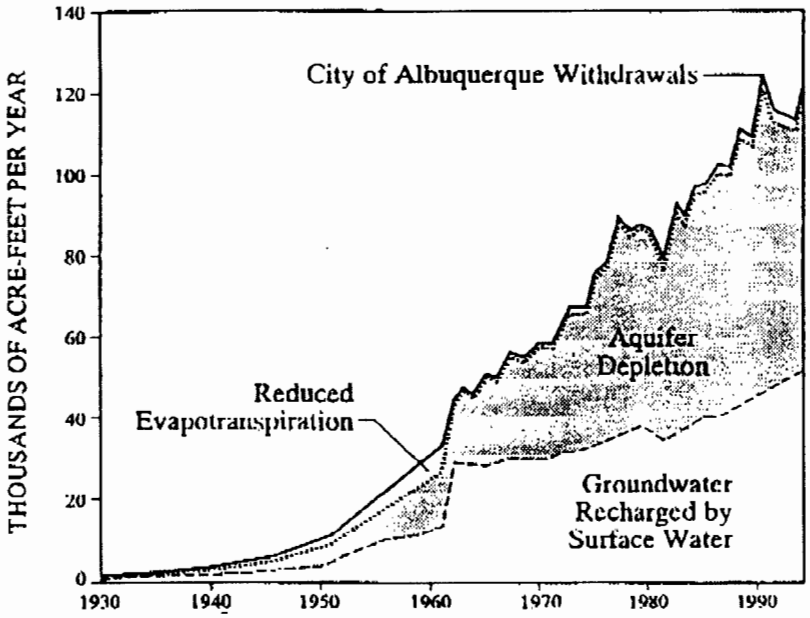

Figure 1-5. Albuquerque's Mining of the Aquifer.

Source: USGS, 1995

These conditions pose many long-term risks to the water supply. As an increasing number of wells compete for a decreasing supply of water, there will be decreased well yields, higher pumping costs, deterioration in water quality, and possibly even a subsiding land surface. The studies also confirm that arsenic is a pervasive problem in the aquifer and that treatment to remove arsenic will be very expensive.

The studies do not show that the aquifer will run out of water soon. There may be a smaller supply than once thought, but it is still enough to serve the City's needs for years. The problem is that extracting water from the aquifer will become increasingly more difficult and expensive.

The USGS computer model is the most accurate tool we have for estimating the effects of well pumping on the river. This sophisticated and detailed model represents a major advance over the simpler calculation procedure developed by the State Engineer in the 1950s. Based on the U.S. Geological Survey computer model, the

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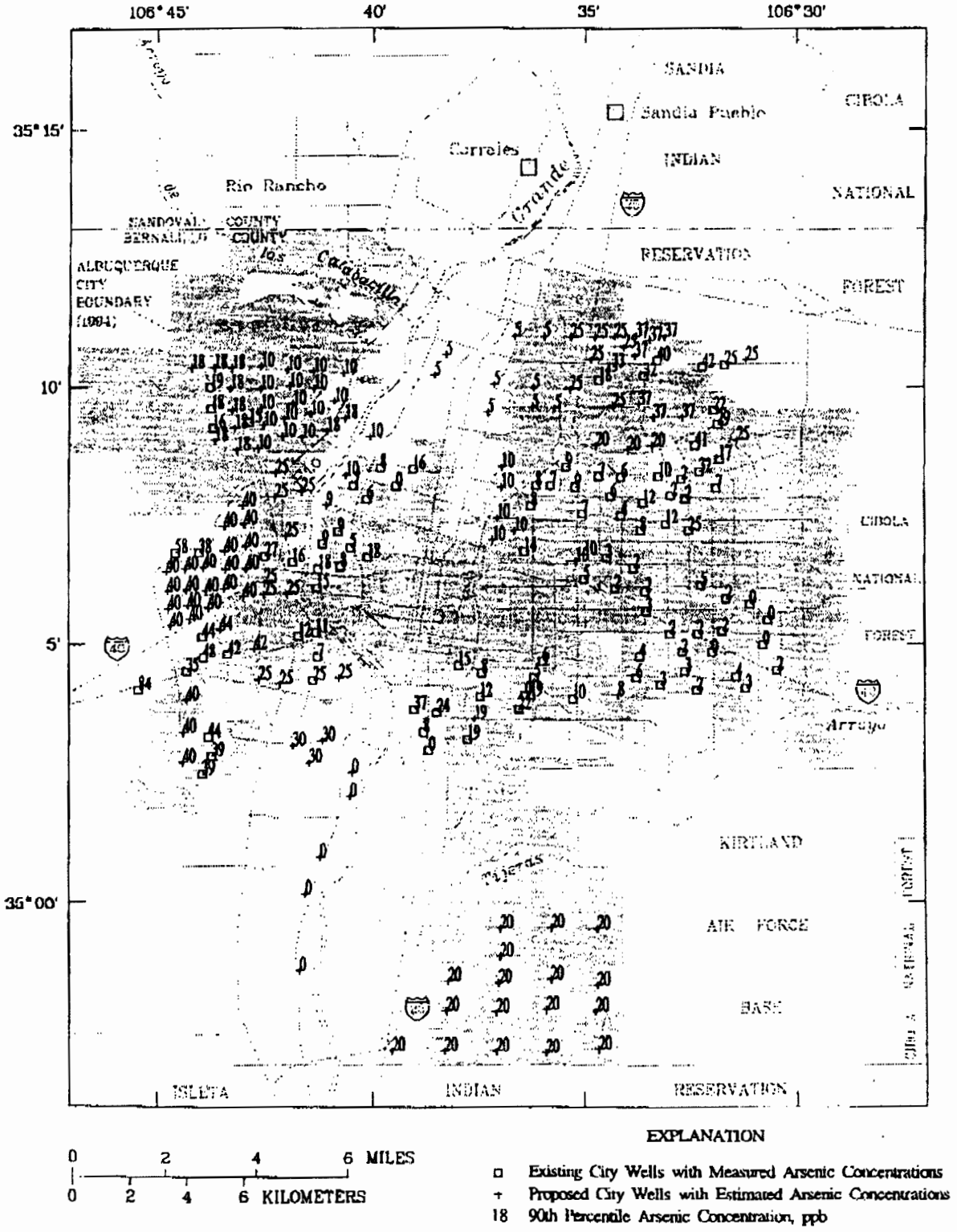

Figure C-38. Arsenic Concentrations in Ground-Water (ppb)

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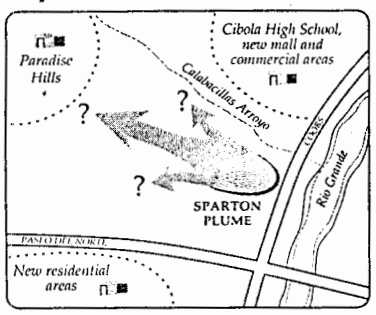


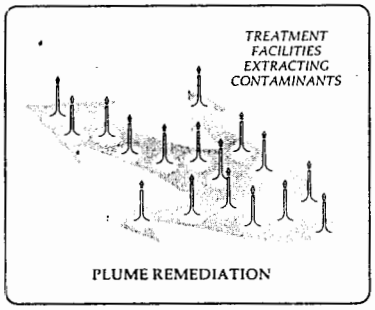
City of Albuquerque Responses to Sparton's Reasons why "Nothing should be done"

The following table summarizes Sparton's assertions, which purport to justify "No Action" as a "solution" to widespread groundwater contamination from their Coors Road Facility, and the City of Albuquerque's responses.

Sparton's assertions are contained in a November 6, 1995, letter with an attached report from James B. Harris, of Thompson & Knight – a Dallas Law Firm, to Desi A. Crouther, Chief of EPA's Hazardous Waste Enforcement Branch Source. The City of Albuquerque prepared the responses.

Migration of Contaminated Groundwater

Sparton's Assertion	The Facts
"... any expansion of impacted groundwater is at a very slow rate and caused by diffusion, the mass of constituents of concern is decreasing, the concentration of those constituents will have been reduced to appropriate levels through natural attenuation before there could be any impact on public water supply wells, and existing institutional controls will prevent private wells from tapping into impacted groundwater before restoration is achieved." (p. 1 of cover letter)	Widespread and significant amounts of groundwater contamination exist at the Sparton Technology, Inc. Coors Road facility in Albuquerque. The primary hazardous constituents include trichloroethene (TCE), an industrial solvent and suspected human carcinogen, and various metals, including hexavalent chromium, acutely toxic at moderate doses and a known respiratory carcinogen in humans. The data gathered to date show continuous disposal and release of a hazardous solid waste, TCE, from the Sparton site. The data clearly indicate that the contamination levels both onsite and offsite present an imminent and substantial endangerment to the region's water supply and to the environment. Neither Sparton nor the EPA have taken action to abate the imminent and substantial endangerment presented by the past, present, and continuous release of hazardous wastes from the site. Sparton's own data show that highly contaminated groundwater has already migrated at least a half a mile offsite and continues to move rapidly; concentrations are increasing, not decreasing, at offsite monitoring wells; there are no data to support the assertion that the mass of contaminants is decreasing. Existing private wells are already close to the plume of contamination and existing City plans call for new wells in the vicinity.
"EPA incorrectly calculated the rate of plume movement and mistakenly concluded the dominant transport mechanism is advection . . . the plume is currently moving primarily by means of diffusion and not advection" (p. 7)	It is simply impossible for diffusion to have caused the large areal extent of contamination, which Sparton's own data clearly shows. The observed contamination could only have moved such long distances (over a quarter of a mile, but the limits have not been determined) and spread over such a large area (over 90 acres) if carried by moving groundwater (advection). And the groundwater continues to move, contamination continues to spread.
"EPA has incorrectly refused to accept that constituent concentration and constituent mass associated with the plume have substantially decreased since off-site sampling began in 1989." (p. 9)	The problem is that the contamination at the most distant and deepest wells is increasing. TCE concentrations at Well 61, according to previously undisclosed Sparton data, have increased even from the very high levels observed in 1993 (490 to 610 micrograms per liter–the drinking water standard is 5 μg/L) to 2,000 μg/L in 1995. Because the most distant and deepest wells have high levels of contamination, the extent of contamination is not known. So it is impossible to know the mass of contamination migrating through the aquifer. And if you don't know how much is there, it is impossible to say whether it's increasing or decreasing. We do know that high levels of contamination have persisted for many years at many wells near the site, suggesting that continuing sources of contamination may actually be introducing more mass into the groundwater.



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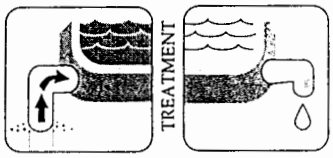
Corrective Measures

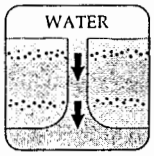
Key to Terms

Pump and Treat –
pumps groundwater up to the surface for treatment. A variety of proven treatment methods exist. The treated water can then be used on the surface for irrigation or it can be used to replenish the aquifer. This can be done through the use of settling ponds or injection wells which force water back into the ground.

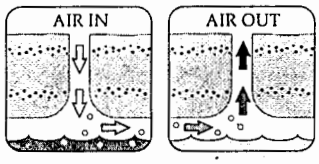
Soil Vapor Extraction –
forces air into the ground in the vicinity of the contamination. This air mixes with the groundwater, picking up molecules of contamination. The contaminated air is then pumped back up to the ground surface for treatment and release.



GROUNDWATER PUMPING — TREATMENT PRODUCES CLEAN WATER



INJECTION WELL



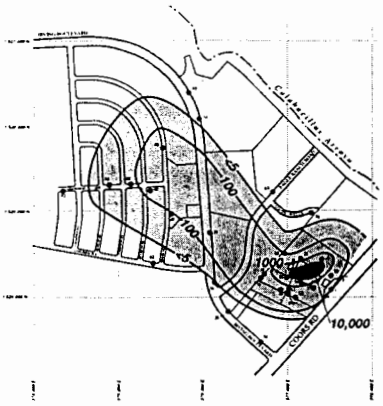
INJECTED AIR CLEANS UNSATURATED SOIL

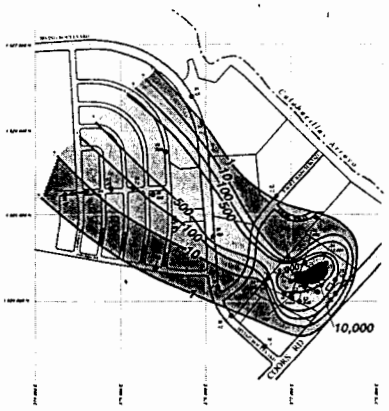
Sparton's Assertion	The Facts
"Neither a pump and treat remedy nor soil vapor extraction would completely prevent migration." (p. 2) "Any pump and treat remedy may be 'technically impracticable'" (p. 11)	If, as Sparton asserts, migration of the plume is quite limited, then pump and treat would be very likely to prevent migration. (But, as we have seen, the plume is migrating.) The fact is that pump and treat remediation schemes are in place all over the country, in New Mexico, and in Albuquerque. They are often the best means available to control contaminant migration and remove contamination from the aquifer. The usual object of soil vapor extraction is to remove contaminant mass (and a potential continuing source of contamination) from the unsaturated zone above the aquifer. This too is a common, viable remedial technology being used throughout the country, in New Mexico, and in Albuquerque.
"Injection wells and/or surficial reuse of treated groundwater are potential alternative methods for dealing with groundwater produced by a pump and treat system. Although both methods allow some local beneficial use, as opposed to river discharge, there are significant technical and legal considerations affecting implementation" (p. 15)	In fact, injection of treated water is a proven technology currently being used across the nation, in New Mexico, and in Albuquerque. Moreover, recent work by the Bureau of Reclamation identifies the Calabacillas Arroyo near the Sparton area as ideally suited for surface recharge facilities.

Trichloroethene (TCE) concentrations – two interpretations

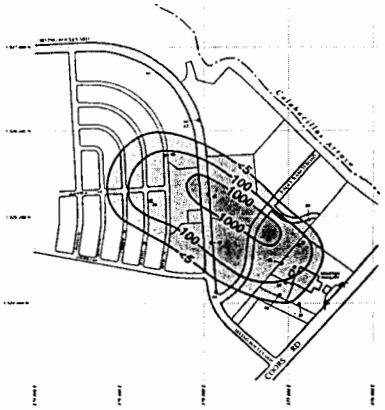
Sparton | City of Albuquerque

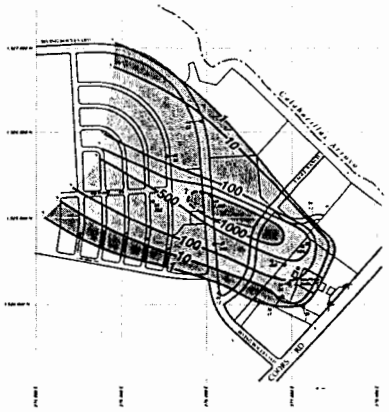
Upper Flow Zone TCE Concentrations





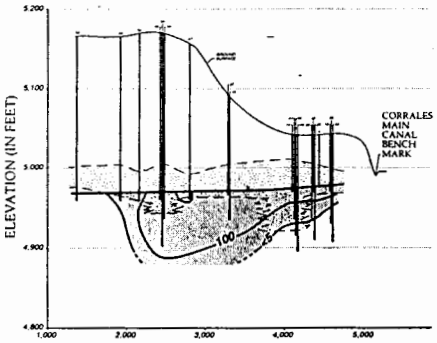
Upper Lower Flow Zone TCE Concentrations

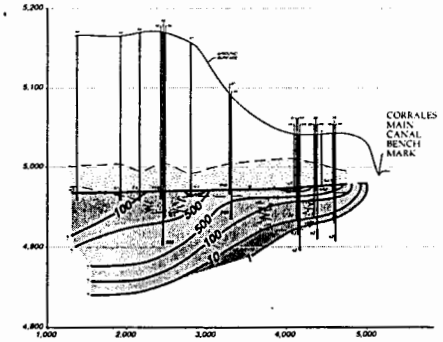




TCE Concentration Profile

SECTION A-A'





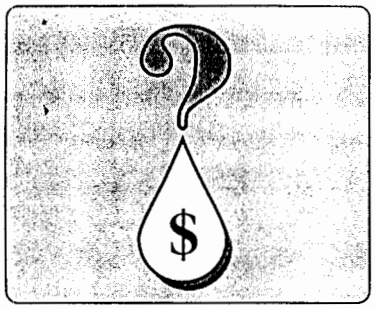
City of Albuquerque

These maps and cross sections present two interpretations of the results of Sparton monitoring well sampling data from 1993 and 1994. They show interpreted concentrations of trichloroethene (TCE), an industrial solvent and suspected human carcinogen.

The figures on the left were developed by Sparton's consultant. The figures on the right were prepared by the City of Albuquerque using the same data. It is clear that the Sparton interpretations very likely underestimate the probable extent of contamination.

These figures do not include previously undisclosed Sparton monitoring data, which were obtained by the City last week. Those data show even higher levels of contamination at many of the offsite wells. For example, concentrations at Well 61 have, as of late 1995, reached levels of 2,000 micrograms per liter (µg/L), up from about 720 µg/L in 1994. (The Safe Drinking Water Act standard is 5µg/L.)

The new data also show very high levels of chromium contamination at many of the offsite wells. Hexavalent chromium is highly mobile in the environment, acutely toxic at moderate doses, and a known respiratory carcinogen in humans. Contamination at levels up to 4 times the standards are now known to exist.



City of Albuquerque Responses to Sparton's Reasons why "Nothing should be done"

The following table summarizes Sparton's assertions, which purport to justify "No Action" as a "solution" to widespread groundwater contamination from their Coors Road Facility, and the City of Albuquerque's responses.

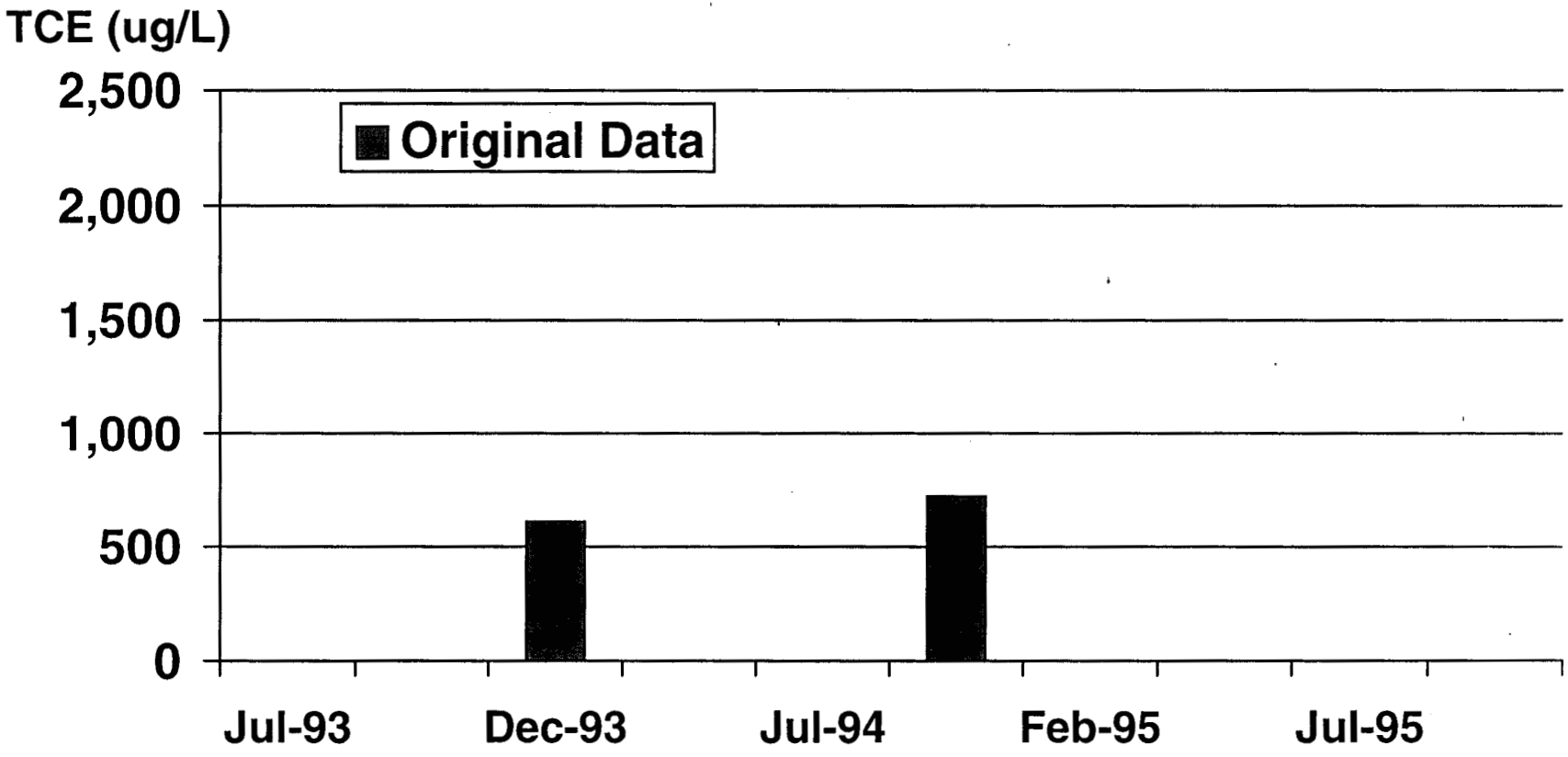
Sparton's assertions are contained in a November 6, 1995, letter with an attached report from James B. Harris, of Thompson & Knight – a Dallas Law Firm, to Desi A. Crouther, Chief of EPA's Hazardous Waste Enforcement Branch Source. The City of Albuquerque prepared the responses.

The Value of the Groundwater Resource

Sparton's Assertion	The Facts
"In the Albuquerque area the sole-source of drinking water is not a regional aquifer" (p. 2)	Groundwater produced from local wells is currently the sole source of drinking water supply in the Albuquerque metropolitan area.
"Public water supply wells are not threatened by the Sparton Plume" (p. 2)	Although several private wells exist in the area, public water supply wells are not currently in the area. The point is that the contamination does pose an imminent danger to scarce drinking water resources. Moreover, the City's water supply master plan calls for new wells in this area to serve a growing part of the City. In addition, because the extent of the plume has not been determined, we don't know the extent of the threat to those scarce resources. But it is clear that contaminants have migrated far offsite and continue to spread rapidly through the aquifer.
"No public water supply wells are planned for development within two miles of the Sparton Plume" (p. 3)	The groundwater contaminated by the disposal and releases from the site is a valuable natural resource committed to beneficial use by the citizens of Albuquerque through various City resource planning documents. The City's current water supply master plan identifies the Sparton area as the location for a new wellfield. It is also located where highly conductive sediments near the Calabacillas Arroyo make this area one of only a few locations where a recharge "window" exists between the surface and the deeper aquifer, affording the City attractive groundwater recharge possibilities.
"The [State Engineer Office] is considering establishing Critical Management Areas (CMAs) where drawdown has been significant. These CMAs, if established, would almost certainly prevent well development west of the Rio Grande (and particularly in the Sparton facility area)." (p. 4)	In fact, the Sparton area is located precisely where State Engineer Office CMA guidelines recommend that new wells be allowed: near the river.
"The Sparton Plume is not a crucial source of drinking water."(p. 5)	The Albuquerque City Council and Bernalillo County Commission disagree. Sparton is located in an area that they have designated as "crucial" for protection of drinking water supplies. The designation reflects vulnerability to contamination and the potential for use of the aquifer. The widespread contamination caused by the Sparton Plume demonstrates the vulnerability of the aquifer in this crucial area.
"EPA's perception of the importance of the Sparton Plume as a drinking water resource overlooks significant concentrations of naturally occurring arsenic." (p. 5)	Arsenic concentrations in the Sparton area, as shown by their own data, are among the lowest on the west side of the Rio Grande, and are far below the limits allowed by the Safe Drinking Water Act.
"Alternative existing renewable water resources are already available to the city" (p. 4)	The City has available surface water resources and is investigating the best way to use them. But they are not sufficient to replace groundwater as a source of supply. Groundwater will always be a key component of the City's water resources management strategy. Possibilities also exist to recycle the City's wastewater, but at a cost much greater than the development of surface water supplies.

Water Resources
PLANNING

TCE Contamination at MW 61



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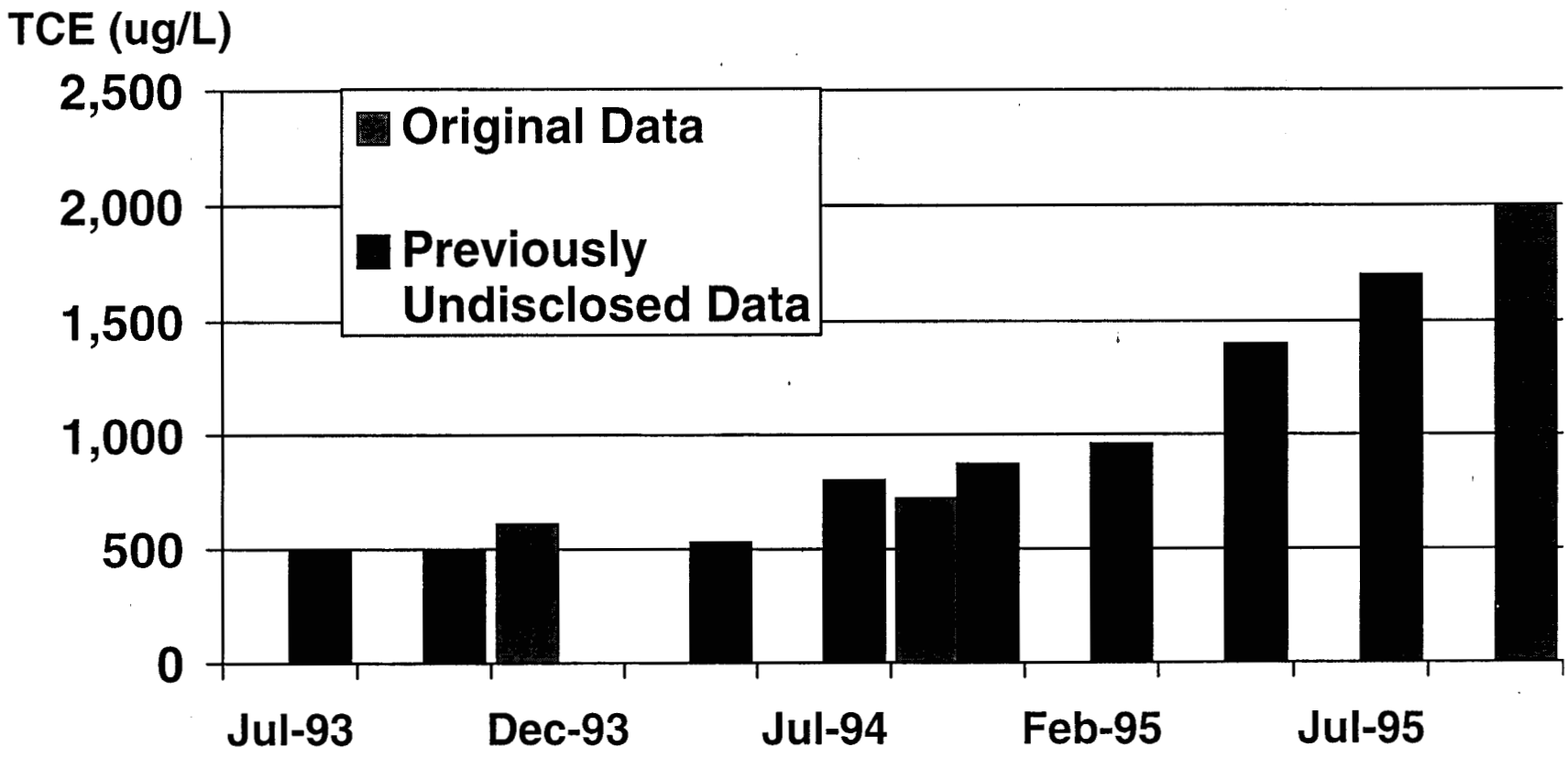
TCE Contamination at MW 61