

Arizona Department of Transportation and Environmental Protection Agency Cooperative Superfund Site Cleanup Effort for Red Mountain Freeway

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Three kilometers (2 mi) of the 10-lane Red Mountain Freeway being constructed in Tempe, Arizona, passes through an Environmental Protection Agency (EPA) Superfund site. The Red Mountain Freeway alignment is adjacent to and crosses the Salt River within the Superfund site. Six alignments through the Superfund site were evaluated thoroughly. The two most critical constraints prevented location of the alignment on either the north or south bank of the river. These constraints were the hazardous wastes in the landfills on the south side of the river and the Indian community to the north. As a result, the freeway alignment is located on structure in the Salt River. The magnitude of the required twin bridge structures caused significant complications in obtaining a Section 404 permit from the U.S. Army Corps of Engineers. Such a river crossing within an EPA Superfund site is a unique situation. It took 4 years of negotiations with EPA to reach agreement on conditions under which the Arizona Department of Transportation (ADOT) would be allowed to remove landfills on property acquired for the freeway. In March 1992, a one-of-a-kind "agreement and covenant not to sue," which sets forth ADOT's cleanup responsibilities and relieves ADOT from any future liabilities for Superfund cleanup costs, was executed between EPA and ADOT. The cleanup is expected to be completed by January 1, 1996. Two phases of cleanup work are required. The first phase—to clear for freeway construction—was completed in 1993, and the second—to clear an additional area for river channelization—will be performed in 1995.

In October 1985 the citizens of Maricopa County, including the entire Phoenix metropolitan area, voted to increase the sales tax a half cent for the purpose of building a 370-km (231-mi) system of freeways and expressways. The system includes the Red Mountain Freeway, which is located in Phoenix and Tempe (Figure 1) and is considered to be the centerpiece of the system because of the congestion relief it will provide, carrying up to 200,000 vehicles per day. Construction is to be completed in mid-1995.

Three kilometers (2 mi) of the 10-lane Red Mountain Freeway currently being constructed in Tempe passes through an area designated by the Environmental Protection Agency (EPA) as the Indian Bend Wash Superfund site. The circumstances associated with an environmental constraint of this nature proved to be extremely difficult and challenging and ultimately resulted in the execution of a one-of-a-kind formal "agreement and covenant not to sue" between EPA and the Arizona Department of Transportation (ADOT) so that

the freeway could be built. Under the terms of this covenant, ADOT would not be responsible for any existing groundwater contamination within the purchased right of way. In return, ADOT would clean up all landfill material in the freeway construction work area.

The Indian Bend Wash Superfund site is an area of 30 km² (12 mi²), 3 km (2 mi) wide, bounded by Scottsdale Road on the west and Pima Road on the east. The area was designated on the National Priorities List of hazardous substance sites in September 1983 because contaminated groundwater exists under the site. Since the Superfund site is 10 km (6 mi) long from south to north, it could not be avoided by any viable freeway alignment. The portion through which the freeway was to pass is characterized by a number of construction debris landfills and isolated potential hazardous waste sites.

Another significant factor in determining the location of the Red Mountain Freeway was the proximity of the Salt River Pima-Maricopa Indian Community (SRPMIC). The Indian property boundary between McClintock Drive and the Pima Freeway falls approximately along the north bank of the Salt River. Because ADOT has no rights of condemnation for Indian property, the Indian Community had absolute control over any possible freeway alignment north of the river.

FREEWAY ALIGNMENT

Finalizing the freeway alignment through the Superfund site was extremely challenging. Six alternatives for this 3-km (2-mi) reach were eventually considered (see A, B, C, D, E/Selected, and Initial on Figure 2): three along the south bank of the Salt River, two along the north bank, and one on structure in the river.

Initial Alignment

As identified in the East Papago (now Red Mountain) Freeway location and design concept report of September 1987, the alignment initially selected for the Red Mountain Freeway crossed the Salt River in a southeasterly direction east of McClintock Drive and continued easterly along the south bank of the Salt River to the interchange with the Pima Freeway 1.6 km (1 mi) east of McClintock Drive.

This alignment would not have resulted in any significant hydraulic impact to the Salt River because of the alignment of the river crossing, nor would there have been any significant discharge of fill material into the Salt River resulting from construction activities.

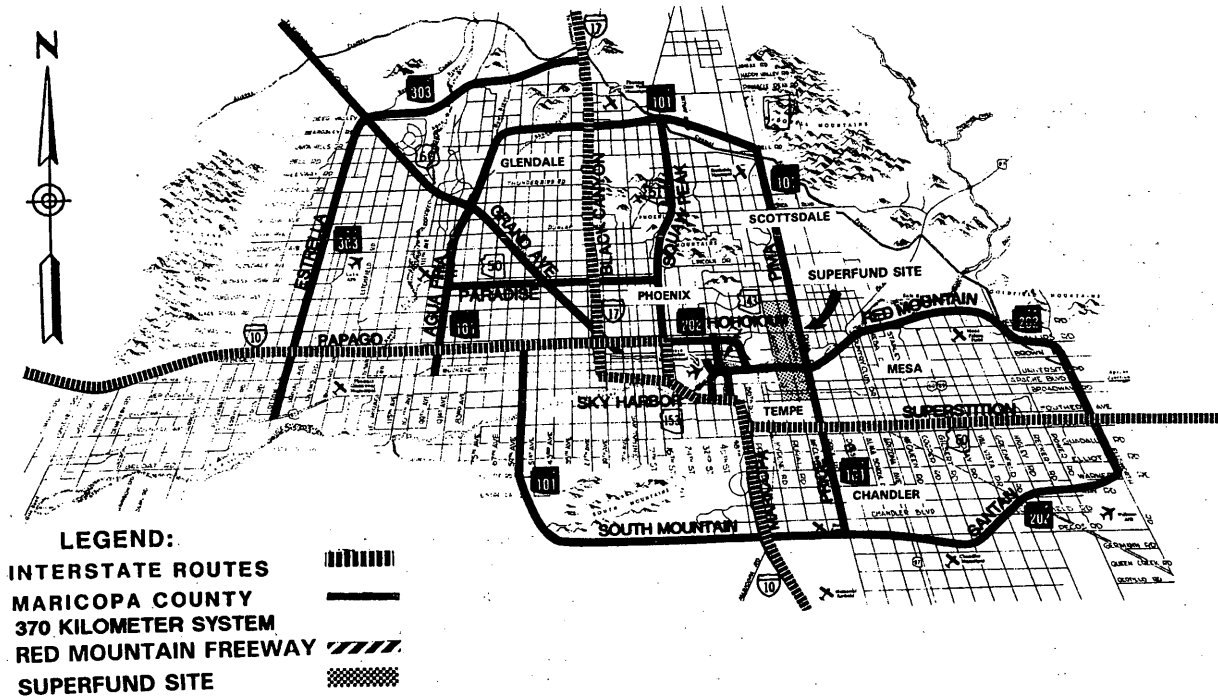


FIGURE 1 Phoenix area freeway system.

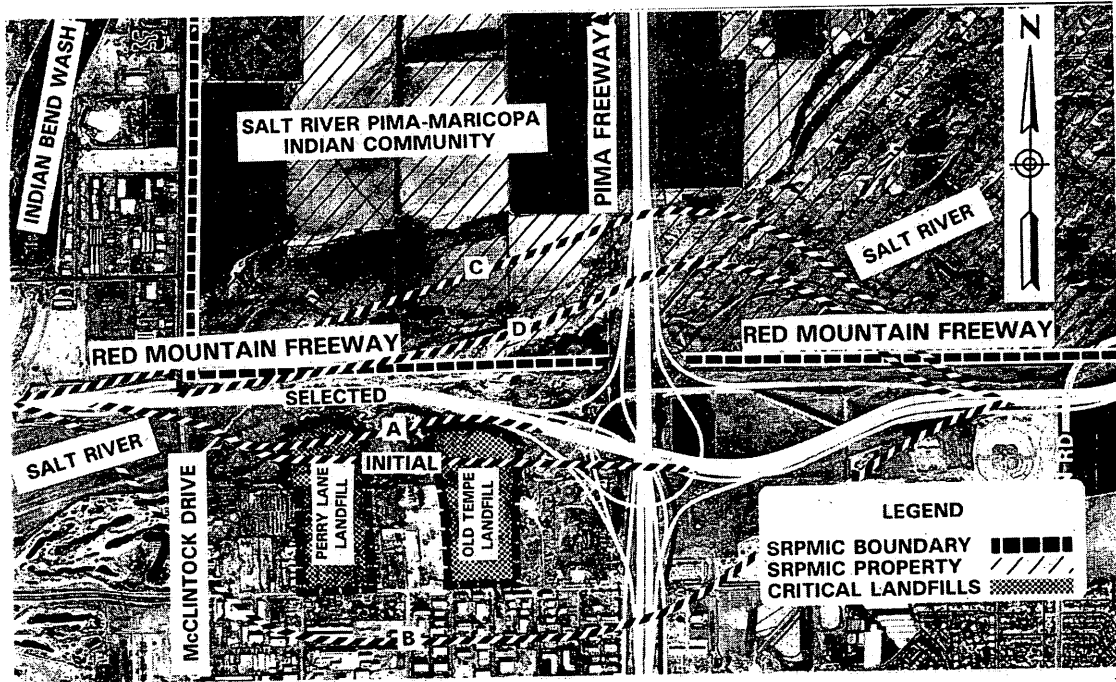


FIGURE 2 Alternative alignments.

Environmental factors were the most significant considerations related to this alignment. Crossing the Salt River at this location caused the freeway to traverse the Perry Lane landfill on the south side of the river and continue east on an alignment that crossed through the Old Tempe landfill. Results of an extensive environmental testing program indicated that these landfills potentially con-

tained considerable amounts of hazardous materials, especially the Old Tempe landfill. The cleanup cost required to mitigate these hazardous materials was considered to be prohibitive, estimated to be as high as \$100 million.

Bioremediation, soil gas extraction, removal, and incineration were considered as mitigation measures. Complete removal is the

only way to fully mitigate impacts from landfills—because of their heterogeneous nature—so this initial alignment was determined to not be prudent because of the possibly exorbitant cost of the environmental mitigation measures.

Alternative Alignments

Four other alignments were evaluated on the basis of five key factors:

1. Environmental considerations,
2. Impact on the Salt River Pima-Maricopa Indian Community,
3. Hydraulic considerations,
4. Cost, and
5. Highway geometrics.

Alternatives A and B were located on the south side of the Salt River and Alternatives C and D, on the north side, as shown in Figure 2. All four of these alignments were eventually rejected. The evaluation matrix in Table 1 indicates which factors were negative and caused each alternative to be eliminated from consideration. It also reflects the impact of the selected alignment.

Selected Alternative

The selected alignment crosses McClintock Drive at the north bank of the Salt River, continues east up the river on structure, and intersects the Pima Freeway on the south bank at the Red Mountain traffic interchange (Figure 3).

Extensive environmental investigation was performed for this alignment in cooperation with EPA's Superfund staff after all other alignments had been rejected. This alternative avoids the major areas of contamination (landfills), and no hazardous material was found on the river property required for construction of the Red Mountain Freeway. Additionally, the Salt River environment would be enhanced by the removal of a considerable amount of municipal solid waste, rubbish, and construction debris deposited in the area, as well as unidentified hazardous wastes that are sometimes found in conjunction with such material.

Only minor hydraulic impacts caused by the freeway bridges crossing the Salt River are associated with this alignment, and discharge into the Salt River is not a significant factor. Building a longer bridge crossing of the Salt River increased the freeway costs (\$15 million) for this particular alignment. However, the fact that little or no hazardous waste cleanup costs are anticipated for this alignment readily offsets the higher bridge costs.

In conclusion, the selected alternative is acceptable in terms of environmental, hydraulic, cost, highway geometric, and social and economic factors. The Indian community concurred with and supported this alignment, which was a critical factor. Therefore, the Arizona State Transportation Board approved this alignment with the concurrence of EPA.

EPA AGREEMENT

The Red Mountain Freeway alignment passes through the EPA-defined South Indian Bend Wash study area as previously described. The freeway development plans had to be coordinated with the EPA cleanup activities. The design concept report that recom-

TABLE 1 Matrix for Evaluating Alternatives

FACTOR	ALTERNATIVE					
	INITIAL	A	B	C	D	SELECTED
ENVIRONMENTAL	●	◐	●	○	○	○
SRPMIC IMPACT	○	○	○	●	●	○
HYDRAULICS	○	●	○	○	○	◐
COST	●	●	●	◐	◐	◐
HIGHWAY GEOMETRY	○	◐	○	○	◐	○

Severely Negative ●
 Moderately Negative ◐
 Neutral ○

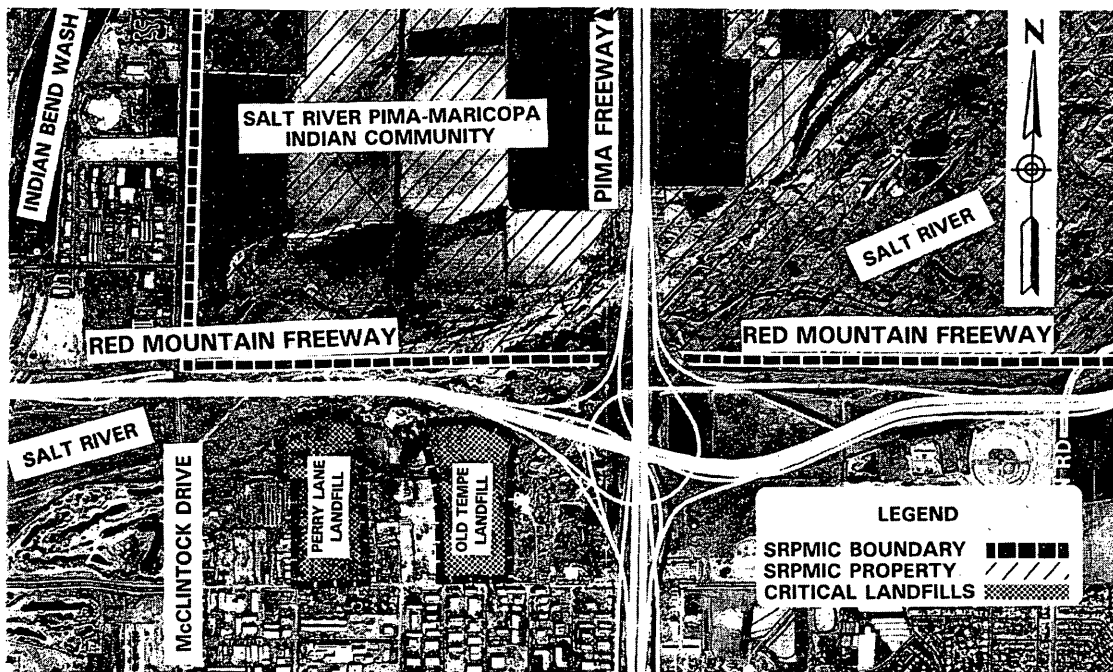


FIGURE 3 Selected alignment.

mended the initial alignment for the Red Mountain Freeway identified the landfills and Superfund involvement as major issues requiring resolution before final design development.

In 1987, when initial discussions with EPA began, EPA had done little investigative work on the location and extent of hazardous waste within the Superfund site. Since the South Indian Bend Wash study area potentially contained many isolated hazardous waste sites in addition to the landfills, and since the landfills were of such a heterogeneous nature, EPA had anticipated that it would be many years before it would complete its study, identify the responsible parties, and determine the most appropriate remedy for clean-up. This meant that ADOT would not be able to define its liability under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, or the Superfund law) for many years.

At that time the target for completing construction of the Red Mountain Freeway was the end of 1992. To expedite the freeway development process, coordination meetings were held frequently with EPA to (a) determine how ADOT could sample, test, and characterize wastes found on properties to be purchased for the freeway, and (b) find a way to limit ADOT's liability before it bought right of way.

Under Superfund law, if ADOT purchased right of way that contained hazardous wastes that were contributing to the groundwater contamination, ADOT could become a "deep pocket" and be held responsible for the costs to clean up properties outside the freeway right of way owned by parties unable to pay their own cleanup costs. This "deep pocket" provision in CERCLA law is called joint and several liability. Additionally, ADOT did not want to be responsible for the Superfund site groundwater cleanup which could cost hundreds of millions of dollars over a 10- to 50-year period.

As a result of the discussions with EPA over many months and of extensive environmental sampling and testing of right of way necessary for the initial alignment, it was determined that the potential liability for hazardous waste remediation was cost-prohibitive

and could not be accomplished within the desired time frame for completion of the Red Mountain Freeway. This decision resulted in the evaluation of the alternative alignments as previously discussed.

The selected alternative minimized the involvement with properties that might contain hazardous wastes by avoiding landfills to the extent possible, which was achieved by constructing a major portion of the freeway within the South Indian Bend Wash area on structure within the floodway of the Salt River. Doing so increased the roadway costs but substantially reduced the potentially high cost of remediating or removing hazardous and nonhazardous wastes.

After extensive discussion, EPA staff determined that there might be a way to assist ADOT with its potential joint and several liability. In 1989 negotiations were initiated and ultimately resulted in the "agreement and covenant not to sue," which was made final in August 1991. The negotiations generated many iterations of the agreement and required considerable legal review on both sides. This was the first time that EPA had executed a prepurchase agreement with another government agency.

The agreement called for ADOT to sample, test and perform a study called an engineering evaluation/cost analysis (EE/CA) to determine an appropriate removal method or remedial action for hazardous wastes that might be encountered.

ADOT would be responsible for transporting any hazardous wastes to depositories approved by EPA. This action would require the development of a detailed plan for removal that EPA had to approve before landfill removal activity could begin. In return, EPA agreed to relieve ADOT from joint and several liability and not hold ADOT responsible for costs of cleaning up groundwater.

To keep the freeway project on schedule, nearly all the sampling and testing were done before the agreement was consummated. The agreement was executed in August 1991, and the EE/CA was approved in July 1992 so that right of way could be purchased and landfill removal within the right of way could begin.

The entire process of gaining the clearance from EPA concerning Superfund involvement took nearly 4 years. It was a particularly

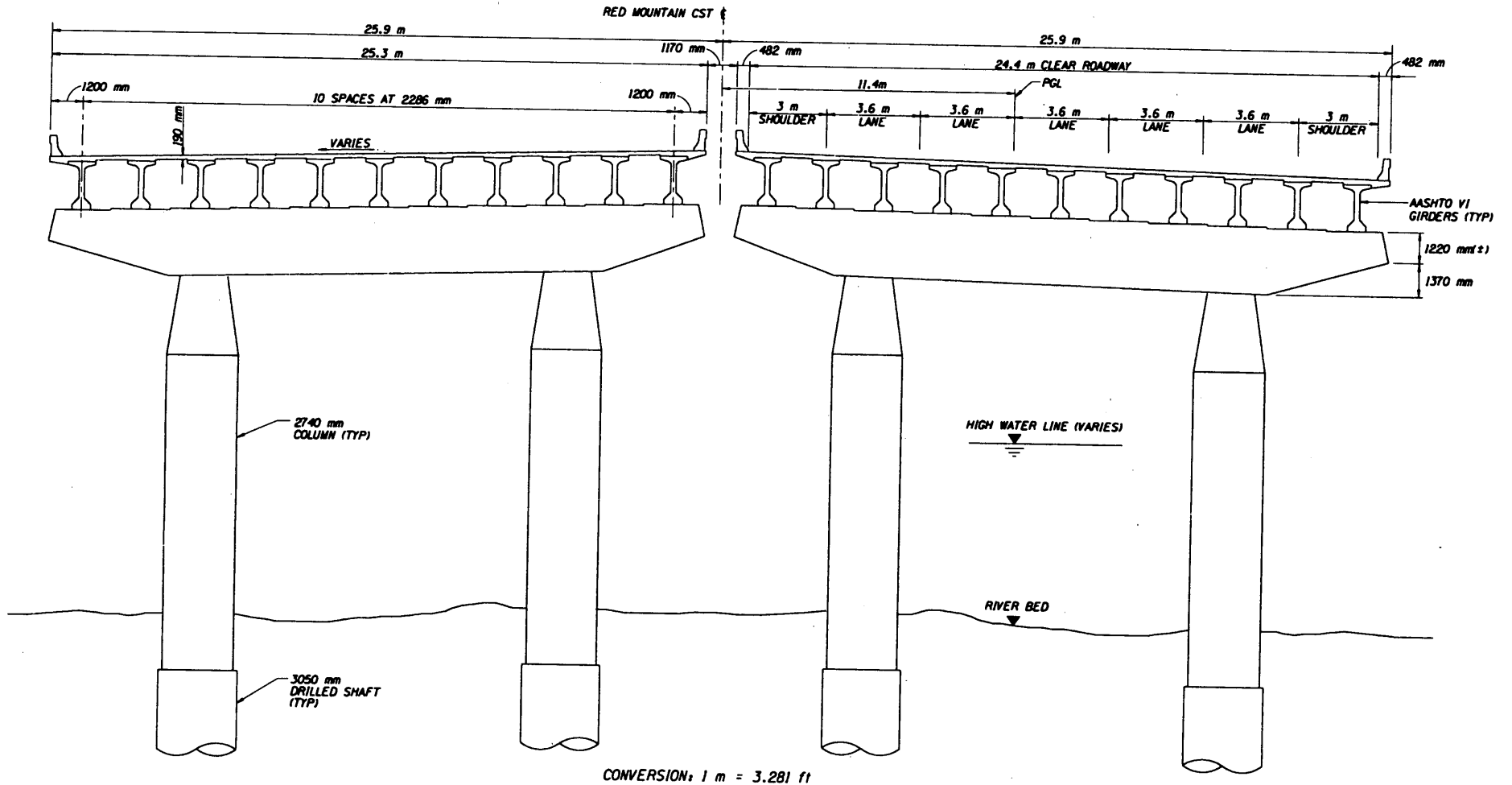


FIGURE 4 Salt River Bridge frame design.

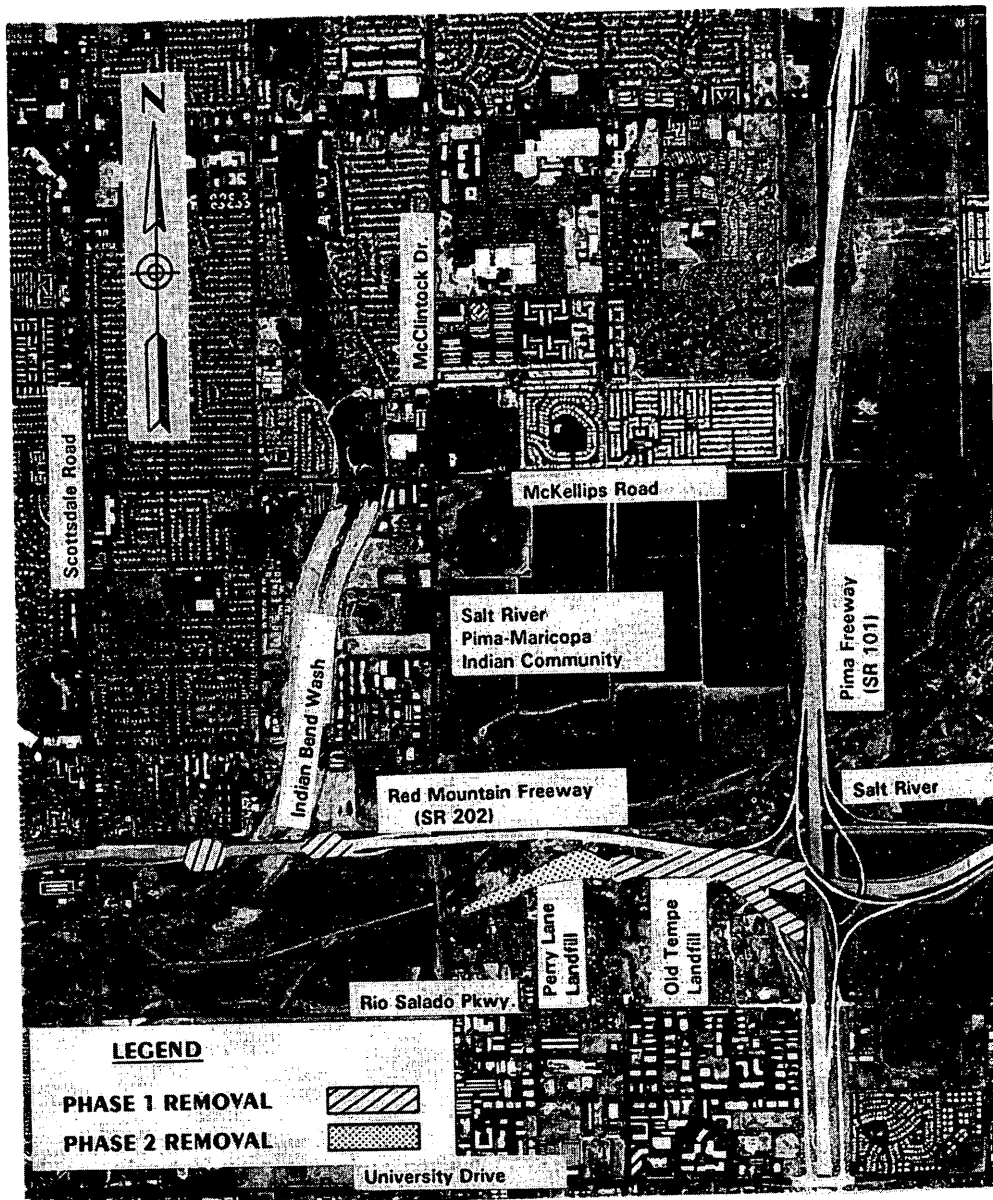


FIGURE 5 Landfill removal.

difficult and frustrating process; ADOT was breaking new ground with EPA, and there did not appear to be any defined policies or procedures to indicate what to expect in advance so that planning related to the construction schedule could have been done.

Even though funding shortfalls have caused delays in completing the Red Mountain Freeway, the requirement of clearing the right of way through the EPA Superfund site would have resulted in at least a 2-year delay. The current completion date is anticipated to be mid-1995. The EPA cleanup efforts will benefit significantly from ADOT's contribution, with approximately 760,000 m³ (1 million yd) of material processed.

It is critical that any potential involvement with Superfund sites or other on-site cleanup activity be addressed early in the freeway planning and development process, and that those individuals involved diligently pursue resolution with EPA. The Superfund process as it exists today is laborious and tedious.

The EPA staff in San Francisco with whom ADOT dealt to obtain the agreement and covenant not to sue indicated that this would be a unique arrangement with another government agency, and that no other such agreements would be considered. However, under favorable circumstances in which a win-win situation might exist, a similar arrangement certainly should be explored.

U.S. ARMY CORPS OF ENGINEERS SECTION 404 PERMIT

The selected Red Mountain Freeway alignment necessitated construction of twin structures over the Salt River, each 25 (83 ft) wide and more than 1.6 km (1 mi) long. Because of the landfill encroachment along the south side of the river channel, the hydraulic impacts of these bridges had to be minimized in order to ensure that

a U.S. Army Corps of Engineers Section 404 permit could be issued.

The initial concern was the effect of the bridge piers on the river hydraulics. To minimize the number of support columns needed, a two-column frame supported by two drilled shafts was designed (Figure 4). Additionally, span lengths were set at 43 m (140 ft) so that standard AASHTO Type VI girders could be used. The resulting hydraulic analysis showed that the freeway caused no significant increase in water surface elevation [less than 300 mm (1 ft)] or velocity [less than 0.3m/sec (1 ft/sec)].

However, erosion of the landfills adjacent to the bridges on the south bank of the Salt River was an issue identified to the U.S. Army Corps of Engineers during the comment period for the Section 404 permit application. Concern about this matter was expressed by several agencies, including EPA, the U.S. Fish and Wildlife Service, the Arizona Department of Environmental Quality, the Arizona Game and Fish Department, the Maricopa County Flood Control District, and the city of Tempe. All agencies wanted to ensure that the Red Mountain Freeway would not increase the erosion of the potentially hazardous material in the landfills.

To satisfy agency concerns, ADOT agreed to provide bank protection in the form of a soil cement levee along the south bank of the Salt River from McClintock Drive to the Pima Freeway. This commitment made it necessary that ADOT also agree to provide similar bank protection along the north side of the river so that the Indian community property would not be eroded by water forced to the north side of the Salt River by the south side bank protection.

The net result is that the portion of the river between McClintock Drive and the Pima Freeway will be channelized, thereby providing a secondary benefit of flood control for 1.6 km (1 mi) of the Salt River.

CONSTRUCTION

The landfill removal effort was split into two phases, the first to allow for the construction of the Red Mountain Freeway and the second to accomplish the Salt River channelization. The first phase was completed in 1993, and the second phase is scheduled to be completed during 1995.

The first phase (Figure 5) addressed (a) the area north of the Old Tempe landfill composed of approximately 380 000 m³ (500,000 yd³) of rock/soil fill, construction debris, and municipal solid waste and (b) two landfills adjacent to Indian Bend Wash, one on either side, containing approximately 115 000 m³ (150,000 yd³) of debris.

Initiating construction was a challenge because the varying interests of the agencies involved complicated the resolution of the 404 Permit issues. The agencies finally reached agreement in July

1992, and the Corps of Engineers issued the permit to ADOT on July 16, 1992. This enabled the Arizona State Transportation Board to award a \$4.9 million construction contract on July 17, 1992, to Sundt Corporation for the first phase of the landfill removal.

Before excavation could begin, Sundt was required to develop a detailed work plan for the excavation, monitoring, segregation, loading, and hauling activities. This document set forth Sundt's responsibilities, which covered landfill removal activities up to the point of discovery of any suspicious materials. At this point, ADOT's on-call emergency response team would be called in to evaluate and treat suspicious materials as appropriate.

The removal effort was quite successful, with the only discovery of contaminated material being about 3800 m³ (5,000 yd³) of rock/soil fill containing petroleum hydrocarbons. The final removal cost was \$5.5 million, including the handling of the special materials and quantity overruns. Despite being hampered by high river flows during 1993, the landfill removal efforts did not delay the freeway construction.

Construction of the Red Mountain Freeway bridges began in January 1993. Of the 13 contractors Sundt Corporation submitted the low bid of \$40.0 million at the November 20, 1992, bid opening; it was awarded the project on December 18, 1992. Thirty months were allowed for completion of the two bridges, and the work remains on schedule.

The second phase of the landfill removal (Figure 5) consists primarily of removing the northern portion of the landfills west of the Old Tempe landfill, including the Perry Lane landfill. This removal will allow for channelization of the Salt River from McClintock Drive to the Pima Freeway to provide flood control for the 100-year event.

The estimated cost for the removal is \$5 million. ADOT will use the work plan developed by Sundt for the first-phase removal because of its successful implementation and utilization. Construction is expected to be completed by the end of 1995.

Once the landfill removal work has been completed, ADOT will produce a final version of the EE/CA that will document the actual findings of the removal (including disposition of any hazardous wastes found) and the costs for the work performed.

CONCLUSION

ADOT's extraordinary coordination efforts with EPA were extremely successful from the perspective of costs. The agreement and covenant not to sue has relieved ADOT of any future Superfund liability, and the Red Mountain Freeway will be constructed in a cost-effective manner.

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