U.S. Army Corps of Engineers
South Pacific Division
Los Angeles District

SANTA CRUZ RIVER WATERSHED MANAGEMENT STUDY

PIMA COUNTY, ARIZONA

Appendix D
Environmental

August 2001

EXECUTIVE SUMMARY
SANTA CRUZ WATERSHED STUDY ENVIRONMENTAL APPENDIX

The Santa Cruz Watershed Environmental Appendix is intended to be a didactic report, in the format of an Environmental Assessment (EA), to instruct and guide in the future preparation of a bona fide EA, but is itself not an environmental assessment of a proposed Federal action. Rather, it presents the elements and required content of an EA which conforms to requirements of the National Environmental Policy Act of 1969, as amended (NEPA), and implemented by Army Regulation 200-2, for a hypothetical example project. The document assumes all analyses would be commensurate with Federal statutes. It demonstrates why a proposed action may be accomplished, under certain circumstances, without the need to prepare a more extensive Environmental Impact Statement.

The example evaluated is a hypothetical scenario developed and intended to illustrate the level of detail, analysis, format, content, and types of evaluations that would need to be encompassed by an EA that would meet federal guidelines. As such, the product is intended to be instructive and usable as a kind of template for future EA's that might be prepared by various jurisdictions within the Santa Cruz watershed.

The example project consists of the use of recycled water for sub-surface recharge. In brief, the EA evaluates a proposal to use CAP water for a novel process in aircraft salvaging at Davis-Monthan Air Force Base, pipe that used water to the confluence of Rincon and Pantano washes, transform an existing sand and gravel operation on the west bank of the confluence into a receiving basin, distributing channels to carry water to the wash, and infiltrate used water through the surface alluvium into deep aquifers.

Compliance with NEPA, the Endangered Species Act, the Clean Water Act, the Clean Air Act, the National Historic Preservation Act, and other appropriate Federal and State laws are as important to its contents as the technical details of getting additional water back in the ground in eastern Tucson. The EA addresses these environmental requirements for the example project in such a way as to demonstrate and display all of the elements required of an EA that would meet federal guidelines.

STRUCTURE OF A FINDING OF NO SIGNIFICANT IMPACT

PANTANO WASH AQUIFER RECHARGE PROJECT, PIMA COUNTY, ARIZONA

The Finding of No Significant Impact (FONSI) concludes all evaluations by the Environmental Assessment (EA) of potential impacts which the proposed action may engender. The signatory accepts legal responsibility for statements of fact which appear in the FONSI.

In brief, the FONSI declares all relevant aspects of project design, implementation, and operation have been scrutinized. In distills the essence of an EA as a document of disclosure to legally binding statements about how the proposed action would influence the human environment and what steps, if any, would be taken to make amends for adverse consequences.

Next, it declares the nature of impacts, and magnitude of each if this can be determined in some way, which may result from the proposed project. Adverse impacts, which in the best professional judgement of the agency preparing the EA, would alter permanently the existing conditions must be declared. Impacts of short-term duration or a negligible level must also be declared.

Third, the FONSI must summarize the mitigation to be adopted as compensation for adverse impacts. Impacts to endangered or threatened species, cultural resources, water quality, or air quality traditionally attract the closest attention of readers. Mitigation for such impacts has to be convincing, either in kind or in quantity.

Finally, the FONSI must state how the sum of potential effects and compensatory mitigation balance out and therefore preparation of an Environmental Impact Statement is not required.

In outline, the FONSI presents in a summary and declarative fashion:

- project purpose;
- project description;
- resources within the area of potential impact;
- lack of impacts, or the reverse if that be the case, upon these resources;
- mitigation appropriate to the severity of impact and which will be implemented.

A summary paragraph very similar in content to this below should declare the substance of analyses in the EA and the FONSI.

I have considered all the available information contained in the accompanying EA regarding design, construction, operation, and potential effects of the proposed project. It is my determination that the proposed action will not result in a significant adverse effect either to the existing environment or the quality of the human environment. Therefore, preparation of an Environmental Impact Statement, pursuant to 33 CFR 230.11, is not required.

Date

Signature Authority

Preface to an explanatory and pilot Environmental Assessment

The document which follows bears the main semblances of an Environmental Assessment (EA) as required by the National Environmental Policy Act (NEPA) of 1969, as amended. However, it describes an artificial project and therefore is not a bona fide NEPA document. Indeed, it was written to be a pilot document, a template of sorts if you will, that both gives a flavor (by example) of the way a proposed action should be evaluated and the nature of evidence the writer should marshal in order to substantiate the evaluation.

Although merely an image of an EA and not the real thing, it still adheres to the two principal roles. First, it discloses as fully as possible what the project entails, how it would work, and how the existing environment could be expected to change. Secondly, it demonstrates why preparation of an Environmental Impact Statement needn't be undertaken.

One size EA doesn't fit all customer. Some accomplish their purpose with relatively few pages, while others warrant longer efforts. An EA needs to be narrative in tone and evoke for the reader a concise mental image of the project and its foreseeable effects. An EA mustn't take on a life of its own however, and therefore the factual information offered needs to be concise and relevant. Pictures still tell a thousand words. Sometimes numbers in tables convey the message most succinctly. Give the disclosure of facts in a thorough, but dispassionate manner. The reader will understand the connections among and reasons for including various kinds of data so long as the document tells a story.

The example is entirely made up - CAP water used at Davis Monthan Air Force Base, then pumped to the feet of the Rincons, there to percolate into groundwater stores - but to the extent possible the information requisite in telling this contrived story is real. Ultimately of course, the author had to make assumptions (read educated guesses) and was limited by lack of details. These are the sorts of information that would be readily at hand, or gleaned along the way, as a genuine proposed project begins to take shape in the narrative. Approximations and educated guesses often have a valuable place in the EA of an actual proposed project.

A future subjunctive tense is commonly used because an EA describes a proposed action, the proposed means of accomplishing, and the anticipated effects it may foster. Until a decision to implement the proposed action has been made, the project does not exist and so the preference for ***would*** rather than ***will*** as a hedge when presenting the proposed action to the body of readers. The story ought to be laid out with a this-is how-it-would-be-done flavor.

Typography

The document attempts to be both as like a genuine EA as possible and set of instructions to help construct a bona fide EA in the future. *Where the EA lapses into instructions or advice it adopts this font*. Unadorned text should be read as though it were an EA.

Table of Contents

1. INTRODUCTION

1.1 PRECIS OF THE ENVIRONMENTAL ASSESSMENT

This Environmental Assessment (EA) presents an analysis of foreseeable environmental impacts attributable to both the construction and operation of a means to replenish a portion of subsurface water stores in an eastern part of the Tucson valley. Preparation of the EA complies with the National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 *et seq.*), the Council on Environmental Quality (CEQ) Regulations (40 CFR Parts 1500-1508), and such requirements as the State of Arizona (legal references) and Pima County (legal references) may impose given the nature of environmental effects which may reasonably be anticipated should the proposed project be implemented.

This EA describes anticipated environmental effects caused by construction of a pipeline and pumping stations to push water from Davis-Monthan Air Force Base (the airbase, hereafter), a shallow basin to receive that water, and flumes to carry water to a typical desert wash. Water would seep through the basin, the flumes themselves, and the wash to recharge groundwater stores. The receiving basin and spreading channels would be constructed immediately west of the confluence of Rincon Creek with Pantano Wash (the confluence, or the washes, hereafter) (Fig. 1A and 1B). The proposed project would expedite infiltration of reclaimed water into subsurface strata upslope from one of the areas of greatest subsidence of the water table west of the Rincon Mountains. It would take advantage of the plans now being implemented to deliver additional needed water to the air base via the Central Arizona Project (CAP), an amount projected to equal about 150,00 gallons per day.

The EA evaluates how the proposed project would, and equally importantly would not, change the existing conditions to resources deemed under NEPA to be important in the overall sense of the human environment. The proposed project could be accomplished without adverse impacts to any resource, as identified in the broad sense by NEPA. It has the potential of a salutary ecological result above ground. By design, it ultimately places CAP water underground in the foot of the Rincons.

The proposed project would entail construction of pipeline slightly more than 8 miles (13 km) in length, two pumping stations, and transformation of an existing sand and gravel operation into a percolation basin. No impacts to listed species, habitat on which any listed species depends, regionally important desert habitat, or cultural resources would occur if this project were to be implemented. No mitigation for impact to any other resource is necessary.

1.2 AUTHORITY

The Pima Association of Governments (PAG) has authorized (*cite wording, resolution number, date, and other relevant legislative directives*) this proposed action as one means by which aquifer recharge and a reduction of further land subsidence could be implemented. At the explicit direction of PAG, this EA has been prepared consistent with NEPA analyses of potential impacts, in the manner of an EA as would be written by a Federal proponent.

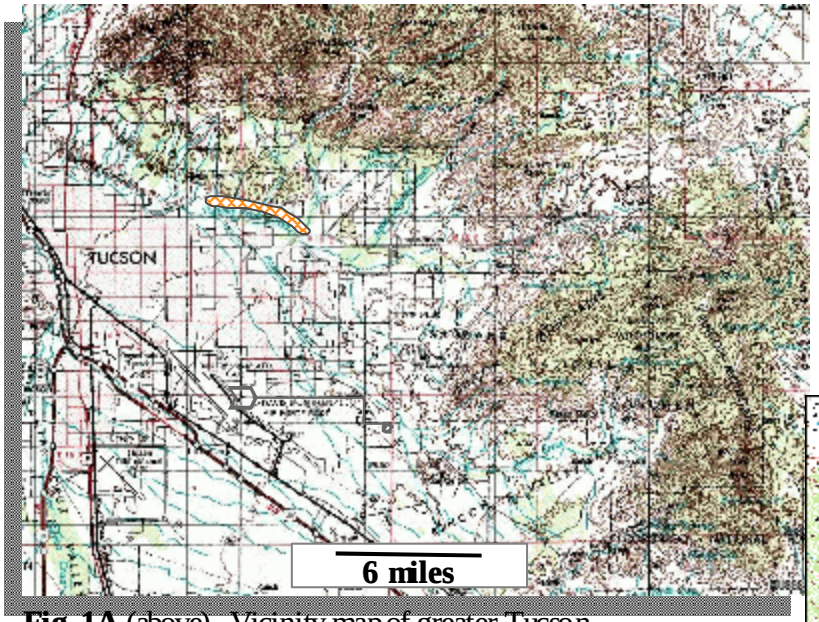
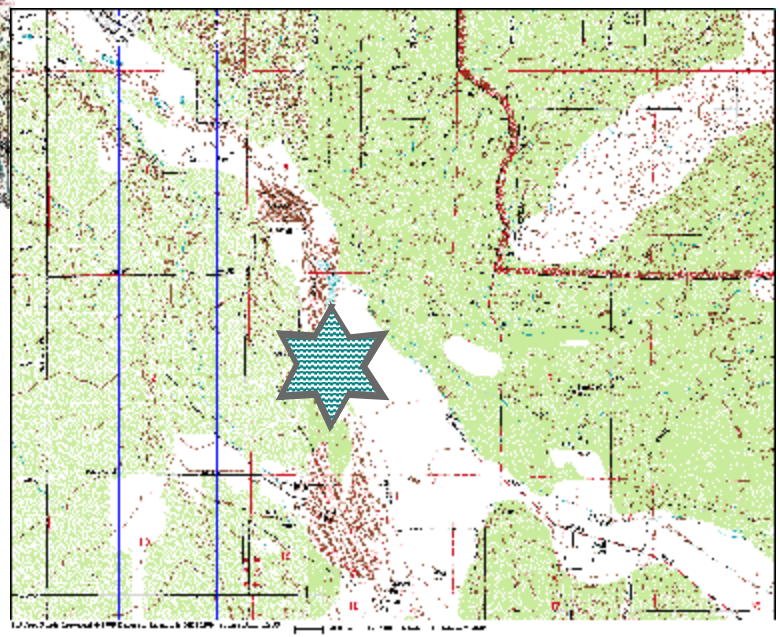


Fig. 1A (above). Vicinity map of greater Tucson. The proposed infiltration project would carry used Central Arizona Project water via a 36" pipe (alignment shown by blue line) from Davis-Monthan Air Force Base to the confluence of Pantano Wash and Rincon Creek.

Excess materials from the pipeline would be used in soil cement bank stabilization along Tanque Verde Wash (orange crosshatching).

Fig. 1B (below). Converstion of an existing sand and gravel mine (star symbol) to a porous receiving basin and spreading channels would allow percolation of water into an aquifer in eastern Tucson. Decades of water mining have drawn down water tables. Ground water recharge at the proposed site coule accomodate as much as 150,000 gallons daily.



1.3 REGIONAL CONTEXT OF WATER MANAGEMENT

1.3.1 Groundwater overdraught

Subsidence of ground water has been a vexing consequence of land use patterns in many settled areas of the arid western states. Tucson has had a 7-decade run of such consequences.

The historic pattern of water consumption in the greater Tucson region typifies economic decisions that were historically made for agricultural reasons throughout most of the arid west. Livestock operations followed a similar path, although by being mobile, herds could be (and were) shifted seasonally to take advantage of water elsewhere. Early in the settlement of an area by Europeans, dry farming techniques could - in some regions- provide enough of a few staples to allow individual families to subsist, and possibly sell or trade what meager surpluses could be harvested. Typically though, sustained nutritional and economic stability rarely came about until groups of farmers (or ranchers, in some instances) began to appropriate surface waters by assorted constructions. In essence, diverting water from natural water courses onto fields allowed for substantially greater yields of crops. A steadier supply of staple crops, or feed crops which could be used to supplement range foods for livestock, meant greater prosperity in general and more people in an area.

In much of the west availability of surface waters is quite seasonal. The recognition that water was accessible from subsurface aquifers provided the impetus to devise various ways to extract that water on a year-round basis. The rest is history.

Ground water extraction typically began as an effort to overcome seasonal limitations of surface water, particularly after surface improvements had diverted a substantial proportion of what once flowed there. There was always an expectation of unlimited supplies, provided the pumping mechanisms had sufficient power, the wells had been drilled to sufficient depth, and climate stayed unchanged. The reality is otherwise. The great bulk of quantity of water sequestered in underground strata frequently traced back through geological time to much wetter periods near the end of the Pleistocene (*cite paleoclimatic, relevant stratigraphy, and aquifer structure papers here*). Climatic patterns of today add only minimal amounts to these older reservoirs. Not understanding the fundamental processes of the water cycle in a broad regional sense, people began extracting ancient water from beneath the ground at a rate far greater than the contemporary climate can replace it. Regional depletion of groundwater in southern Arizona has exceeded natural replenishment 500-fold, and that a conservative comparison (Schumann and Cripes, 1986.) In essence, water appropriation practices were negative nearly from the start, with the net result that underground stocks were depleted steadily and rapidly. As water tables declined, wells were extended to compensate for the very effect the wells themselves exerted. In consequence, water tables dropped rapidly.

Since 1940 changes of depth to subterranean water in the eastern part of Tucson have exceeded 200 feet (cite Water Resources, 1999). This perceived as a serious consequence of resource use, one which merits considerable effort to redress.

1.3.2 Central Arizona Project water supplied to the air base

Davis-Monthan fulfills several missions. One involves reclamation of the materials contained within decommissioned military aircraft, planes which will never fly again. The air base functions as a boneyard for salvage of components which themselves are still useful. The air base also recycles aircraft (or their remains) for the metals of which these hulks consist. This element of the bases's overall operation constitutes the Aerospace Maintenance and Recovery Center.

A new technology for reclaiming the metal constituents of aircraft will soon be implemented. The new process requires water beyond what the municipal system currently delivers to the air base. The process can function quite adequately with non-potable water, however. As a compromise to lessen the burden on the municipal water system yet still accomplish the reclamation mission, the extra water will be delivered by direct pipeline to the air

base from the Central Arizona Project (CAP) feeder canal. In normal operations, the airbase should consume about 150,000 gallons of water daily to implement the new technology. After use, all this water will be collected for export from the air base, passed through an oil and grease separator, then through sand filters, and finally through cation exchange vats. The air base would maintain and replenish sand filters and ionic exchange resins as needed. The destination of this non-potable wash water, after processing it to remove potential contaminants derived from its use on base, is the subject of this EA.

1.4 The Need to Act and Purpose of Project

As the level of ground water dwindled with continued extraction, the land form began to deform, the net costs to extract yet more water to rise, Pantano Wash ceased to flow perennially, and the riparian community adapted to these mesic conditions in the desert disappeared. Local entities charged with thoughtful planning for use of natural resources have recognized a need to [defray offset reverse synonym here] the ongoing subsidence of water tables in eastern Tucson, recognizing that no single project can speedily recharge aquifers depleted over the last 9 decades. Even a small restitution to underground water stores would partially satisfy a regional need.

The purpose of this project would examine ways to return water to the underworld. Pima County

Evaluating different means to get more water underground in eastern portions of the valley has led to a plan whose implementation would constitute the purpose of the project, i.e. a way of fulfilling the stated need. Whether or not subsurface water table rises appreciably in direct response would depend on the poorly understood geomorphology of sedimentary strata west of the Rincon Mountains, their capacity to retain water by physical expansion after having been drained of their legacy water content, and the fluid dynamics of water moving through these strata from percolation site at one location and continual extraction elsewhere in the valley.

2. ALTERNATIVE PROPOSALS TO ACCOMPLISH THE PURPOSE

2.1 No Action Alternative

No effort would be made to replace underground water supplies by any secondary use of water from the air base. The volume of water brought to the air base for its new facilities would need to be carried away after use. The No Action Alternative would do nothing to address the need to rejuvenate underground water stores. Business operations at the sand and gravel pit would carry on without economic considerations of selling the property for conversion into a groundwater recharge installation.

2.2 Alternatives Not Considered Further

Potential actions were entertained, but rejected for one reason or another. They are presented here cursorily and not evaluated further.

2.2.1 Discharge into the Santa Cruz River

Construction of a storm drain pipeline would suffice to transport this wash water downhill from the air base to the river bed of the Santa Cruz. Any resultant ground water recharge associated with this alternative would occur in an area of smaller historic decline than that identified as an immediate need. Since the eastern regions of the Tucson Valley have been accorded greater need, this alternative was not explored further.

2.2.2 Forced injection

This alternative would entail pressured wells drilled in suitable locations on the air base. Pumps run electrically would drive water below ground in as many areas as needed to accommodate the daily average additional supply to the base, 150,000 gallons. Sedimentary strata below Davis-Monthan appear more consolidated and less permeable than those found at the base of mountains east or south of the air base so as a result their capacity to absorb this steady flow of water over a lengthy time is doubtful. If necessary, multiple injection wells would be drilled and water shifted from one area to another depending on local saturation. Preliminary solutions to appropriate numerical models indicate areas around the injection wells would become marshy. Such a change of soil characteristics in a sizeable area of the base would possibly interfere with accomplishment of its missions.

2.2.3 Surface irrigation

The end product of this new technology could be used to irrigate athletic facilities in the nearby area. Such a use would necessitate either full treatment of the used water to render it potable, or construction of a distribution pipeline system entirely separate from existing municipal pipes, otherwise potable water would be contaminated with this reclaimed water. Additionally, evapotranspiration would impair virtually any subsurface penetration of CAP water into underground strata. Nearly all which might be supplied would merely end up in the atmosphere and have little beneficial consequence to the water table. The idea was abandoned for those two reasons.

2.3 PREFERRED ALTERNATIVE : A PERCOLATION BASIN ADJACENT TO A LARGE WASH

The project would make a localized and small scale recharge facility from lands currently being used for building materials (Fig. 2). A modest volume of CAP water would end up underground in southeastern Tucson, and the pace of land subsidence would be slowed but not reversed.

This alternative would make direct use of the capacity for infiltration inherent in the substrate of a natural and historically perennial stream bed. Reclaimed water pumped from the air base would, first, be held briefly discharged into a retention basin then directed by way of serpentine channels toward Pantano Wash. The basin, channels draining it, and the streambed of Pantano Wash would each behave as percolation features. Periodic maintenance of the basin and separate channels would probably be necessary. The entire percolation facility would be constructed within the footprint of an existing sand and gravel pit on the west edge of Pantano Wash. Water would be delivered from the air base via a pipeline to be constructed along existing roads.

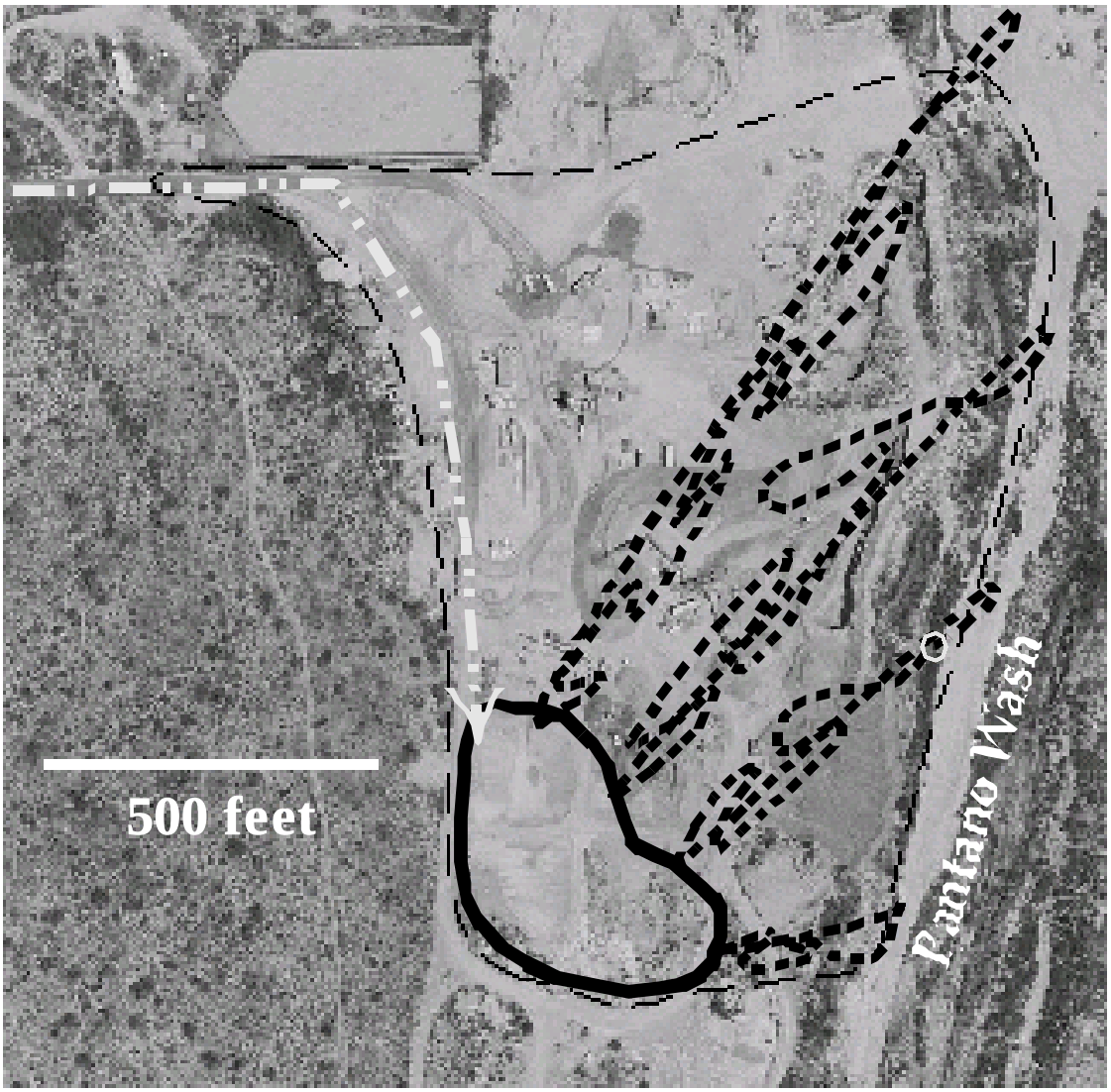


Fig. 2. Aerial photograph of existing sand and gravel mine on the west bank of Pantano Wash, and conceptual rendering of the proposed percolation site. Water would arrive via a new pipeline (light, dash-dot line) at the receiving basin, about 3¼ acres in size (solid line). Contorted flumes (dotted lines) would carry water from the receiving basin (at about 2847 feet elevation) toward Pantano Wash (elevations between 2828 and 2822 feet). These would be shallowly inclined and their re-bent shape would promote optimal infiltration. Yellow circles denote sites of subsurface exploration for cultural deposits buried in the remnants of undisturbed bank. All earthmoving at the mine would occur within about 30 acres of land already highly disturbed (thin dashed line), except where notches through the bank must be created.

The air base will make and operate as part of its costs all the facilities needed for off-base disposition of this reclaimed water. This proposed project takes possession of used water from its point of discharge from the base, and from which solids such as metal scraps, various lubricants, and other coarse contaminants have been removed.

2.4 PROJECT DESCRIPTION

The description of any proposed project serves all readers best when presented as thoroughly and accurately as can be achieved. This portion sets the stage for descriptions of relevant existing conditions, those which might be changed by construction or operation of the project, and for the analysis of foreseeable project effects. To the extent the project is actually an evolving idea while the EA is being written, the project design may profit substantially by suggestions which actually take shape via the writing.

2.4.1 Pipeline

Reclaimed water would be exported from the air base via a new pipeline consisting of 36" diameter sections. The interior of the pipe would be as smooth as feasible in order to reduce friction and cavitation. Composition of the pipe would be determined following appropriate analyses of soil borings to characterize the chemical reactivity of soils along the proposed route.

The line would be excavated beginning from the collection site on base and follow an alignment along the south side of Irvington Road, to its intersection with south Houghton Road, as illustrated (Fig. 1A). This segment of the pipeline would be approximately 5¾ miles (9¼ km) in length. At that intersection, the pipeline would turn due south and follow Houghton Road for 1 mile (1.61 km), then turn east on Drexel Road for a distance of about 1¼ miles (2 km). The pipe would be fortified by thrust blocks at these corners. Such an alignment would make three right angle turns. The pipe would be fortified by thrust blocks at these corners.

At the western edge of the gravel pit, the line would turn nearly south again, for a distance of about ¼ mile (0.4 km) where it ends and discharges water into the receiving basin. The exact alignment of the last portion would be established following careful topographic survey.

2.4.2 Pipeline spoils

All materials excavated during construction of these three segments would be stockpiled temporarily along the construction easement. To the extent possible these spoils would be used as backfill of the trench, to be compacted after the pipeline has been constructed.

Excess spoils would be hauled from the pipe alignment to a reach of Tanque Verde Wash (Fig. 1A) where eroding banks are being stabilized by soil cement. Materials from this pipeline trench would be blended with the cement and applied to existing bank surfaces prepared to receive this stabilizing coating.

2.4.3 Pump stations along the pipeline

Water must be pushed uphill to accomplish this project. The tentative collecting station on the air base is at about 2685 feet elevation, while the surface of the receiving basin would be at about 2850 feet elevation, a net climb of approximately 165 feet. The airbase would deliver water from the collecting station with a minimal head to the pipe's intake. The proposed project

would necessitate a primary pumping station at this transfer point, then a secondary booster pumping station where the first right angle occurs, at Irvington and Houghton Roads. Both pumping stations would be underground. Power would be delivered to them from existing above ground lines.

Design considerations of pumps, the interior surface of pipe material, the corners, and so forth would include also the potential for additional input along the route. The daily volume currently envisioned (150,000 gallons) requires application of enough force to water in the pipeline to impel an average speed equal to 0.03 ft/sec. The amount carried in the pipeline could be augmented in the future by stronger pumps.

2.4.4 Receiving basin

Raised berms would surround a shallow pit made in the southwestern part of the percolation site by pushing up the materials which comprise the existing gravel pit surfaces (Fig. 1A &B, Fig. 2). The basin would, tentatively, be formed with about 3¼ acres surface area. The expected normal flow through the basin, 150000 gallons daily, would spread to a depth of less than 4 inches over that acreage. If shaped to be at least three feet deep, the basin would rarely have less than 2 feet of freeboard and hence would be most unlikely to overtop its berms. Its design would easily accommodate two to three times that daily flow, should additional water sources become available in the future or heavy runoff from summer thunderstorms be captured in this system.

Water would soak directly into alluvial sediments through the bottom of the receiving basin.

2.4.5 Shallow flumes and creeping water

A differential of 19 to 25 feet exists between the receiving basin's bottom (about 2847 feet) and the surface of Pantano Wash (2828 to 2822 feet elevation). The project's design would take advantage of that gravitational head to disperse more water into these aggregate sediments.

Serpentine flumes would be scraped between the receiving basin and Pantano Wash. Each would deliberately follow a shallow incline and their backbends (Fig. 3) would slow the movement of water still further, the better to increase percolation. These channels would be made by pushing up low berms, 2 to 3 feet high and about 30 feet apart. Four such channels would carry all water which does not otherwise percolate directly into sediments from the basin toward the wash. The channels themselves would function as percolation sites. Water not absorbed through the bottom of the receiving basin or along the channels would pass through the western bank (Fig. 2) to reach Pantano Wash, where the last of it would be absorbed by the permeable bottom of the wash itself.

2.4.6 Expendable berms

Both the receiving basin and the channels would be transient features. The bottom of the receiving basin would be re-worked semiannually to prevent formation of caliche or other hardpan layers which would impede infiltration. So, too, would the channels be re-formed completely, and possibly relocated within the overall footprint of the percolation facility. The serpentine pattern would simply be created anew in essentially the same place.

Mechanical reshaping of the banks on the west side of the river bottom would occur. Each channel would require moving about 10 to 15 yd^3 of material to make a notch through the bank and bring the separate channels smoothly into the wash. In total, as much as 60 yd^3 of bank and stream channel sediment would be shifted about during construction. Water carried to the wash would flow on the surface as far as necessary before sinking in completely.

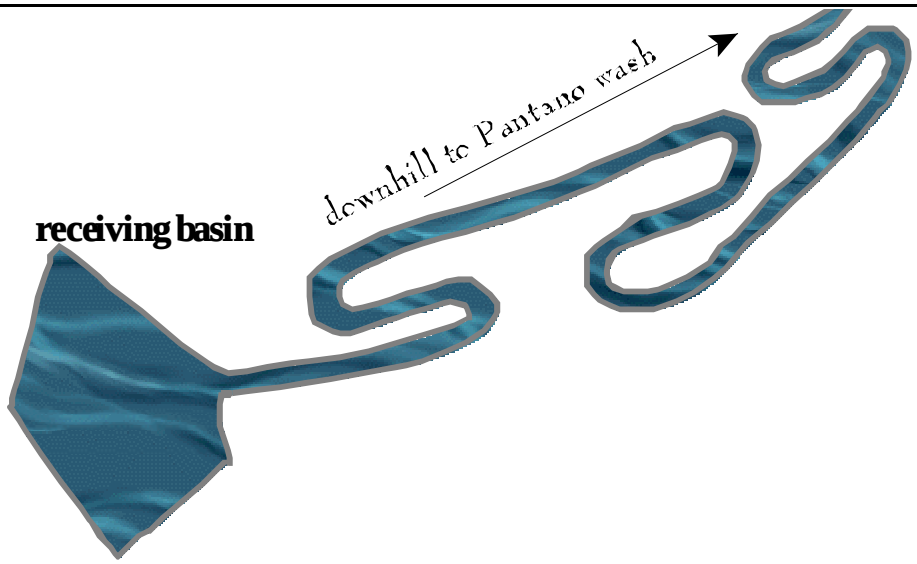


Fig. 3. Conceptual rendering of a shallowly pitched flume designed to carry water from the receiving basin (at about 2847 feet elevation) toward Pantano Wash (elevations between 2828 and 2822 feet, not to scale). Channels would slope gradually, and their re-bent shape would promote optimal infiltration. Alluvial sediments of the basin, the channel bottom, and Pantano Wash itself would each absorb water into underground strata.

2.4.7 Joining Pantano Wash

The individual flumes should join the wash separately, a design that would minimize disturbance to existing banks and vegetation on the west side. Each channel would enter the wash at a shallow angle and pointed downstream. The mouth of each channel would be arranged to minimize the prospects of inducing bank erosion in the vicinity, especially downstream from there.

2.4.8 Periodic maintenance

Water moving through the receiving basin and downhill toward Pantano Wash would likely erode berms which form the basin itself and the spreading channels which drain it. Reconstructive maintenance would be necessary, else the project would soon fail to perform the percolation functions for which it is designed. The receiving basin and spreading channels each might have to be reformed annually, especially if summer thunderstorms in the area wash the berms out.

2.5 ELEMENTS OF CONSTRUCTION REQUIREMENTS

Greater refinement of construction details would depend on many engineering considerations beyond the scope of this EA. The EA should present a careful condensation of these refinements, in a manner similar to this description, which lacks for a great many requisite facts, admittedly.

2.5.1 Equipment and duration

The daily traffic volume along Irvington Road dictates minimal delay between trenching and backfilling once the pipe has been laid. Structural properties of soil in this part of Tucson permit excavation of a vertical trench 6 feet deep and 5 feet wide without temporary shoring. A tracked excavator would make the trench and wider spaces for pipe and vaults to contain a pump, respectively. Construction crews would place a gravel bed on the bottom, set pipe segments in place, join segments, construct manholes for later access, and backfill the pipeline *in an appropriately scaled distance as determined by the engineering considerations*. Other mechanized equipment would operate simultaneously, such as a front end loader, water truck, dump trucks, transit-mix concrete trucks, sheep's foot compactors, and paving equipment. A length of trench perhaps 200 yards long would be open for *perhaps 6 working days*, estimating a pace of at least 100 linear feet of pipeline per day. At that construction rate, building the full pipeline could require as much as 450 working days.

Final repaving of the road surface would require a self-mobile paving machine, suitable compactors and rollers, and delivery of hot asphalt mix from batch plants (*distance away?*) by dump truck. The number of truck trips to transport asphalt mix would be *determined based on final engineering considerations*.

Earth moving required at the percolation basin would occur within the existing footprint of the aggregate mine. Initial contouring of the surface to form the basin and to create serpentine channels leading from it would require 10 days of machinery operation, at the most. A single bulldozer working together with a front end loader and a dump truck (20 yd^3 capacity) would accomplish this part of the construction.

2.5.2 Materials

The sources for bedding gravel, concrete, and any additional construction materials have not yet been identified. To the extent possible, local sources would be preferable because of minimal delays to timely completion of the pipeline and minimum addition to airborne pollutants attributable to driving vehicles associated with the construction.

2.5.3 Construction personnel

Construction of the pipeline would necessitate a crew of 10 on site. This complement would be hired from the available work force in Tucson. Impacts from construction would

necessitate each person driving from home to the work site on a daily basis. That average distance cannot be estimated.

Paved surfaces along Irvington Road dug up in order to build the pipeline would be re-paved as the final component of pipeline construction. Roughly estimating, 10 people would be required, each also driving their own vehicle.

2.5.4 Staging and laydown areas

Excavation for the pipeline and its assembly in discrete segments would begin on the air base, where the ground has already been paved to facilitate the new metals salvaging process, and move eastward along Irvington Road, then south on Houghton, and finally eastward again on Drexel Road. Bulk deliveries of pipe sections would arrive at the paved salvage area on the air base. Pipe stock would be subdivided there into smaller batches and hauled eastward as needed. Temporary stockpiles of pipe section, bedding gravel, and so forth would be necessary at regular intervals along the alignment.

Spoils from trenching would be piled on the road surface between the trench and flow of traffic. In effect, a temporary berm approximately 10 feet wide would accompany the pipe construction as it moves eastward. When a suitable length of pipe has been assembled, a front loader would push spoils back into the trench for compaction above the pipe. Excess spoils would be hauled offsite to a materials staging area for Tanque Verde Creek, there to be blended into soil cement.

Mechanized equipment needed to shape the receiving basin and spreading channels would be stored at the existing aggregate mine.

3. ENVIRONMENTAL SETTING AND EXISTING CONDITIONS

3.1 SOILS AND GEOLOGY

Alluvial materials now being extracted from deposits along Pantano Wash by the commercial business which operates the gravel pit were deposited over centuries by both water courses. They are unconsolidated. Two wells exist in the immediate area, one just above the confluence [well id. # (D-15-16)17bca], the second [well id. # (D-15-16)06aac] roughly 3¼ km downstream from the confluence and through consolidated rock units on the east side of Pantano Wash. They are 73.1 m and 103.6 m deep, respectively. As inferred from these well logs (*cite specific informative data from each log, and any others in the vicinity which may have been drilled for scientific purposes and went to greater depths, say 200 to 400 m*) alluvium in this area (*e.g. gradation data, silty fines less than 2% by volume*) extends at least 150 m below the surface. The upper 100 m, at least, have very high permeability, exceeding 25 inches/hour (*cite NRCD standards, porosity data from Pima County.*). The very porosity characteristics of alluvium which make this location good for aggregate mining also make it good as an infiltration site for partial recharge of underground water.

The subsurface of both Irvington and Houghton Roads have been structurally altered as roadbed foundations. Drexel Road is dirt, formed by scraping away native vegetation, spreading dry aggregate, and compacting it.

The aggregate mine currently being operated at the proposed site was founded on the west bank of Pantano Wash, because the alluvial sediments deposited there have not become lithified to any extent. Erosion of sediments from the Rincon Mountains to the east and the Santa Rita Mountains to the south has carried these various alluvial deposits into the Tucson

basin. Two geologically distinct units of alluvium of more recent Quaternary age mark the actual confluence of the Rincon and Pantano Wash, while one older Quaternary assemblage can still be recognized just downstream on the western side of the wash (Arizona Geologic Survey, 1988). The working surface of the mine is still in these gravelly alluvial layers.

The west bank of the wash is composed of exactly the same materials, but in this spot largely held together by roots of perennial plants. The mining operations have intentionally left these sturdier banks in place to prevent Pantano Creek from breaking into the deposits being worked and flooding the sand and gravel business at this site.

The bottom of Pantano Wash is about 21 m wide (65 feet) just to the east of the mine. After Pantano and Rincon come together, the wash widens to about 65 m (200 feet).

Bedrock does not outcrop within the area now used for mining, not along the west bank of the wash (Fig. 2) at the project site. Hence there are no competent surfaces where petroglyphs would have been pecked. *[judgement call: if sedimentary stratigraphy of the project area were thought unusually important to understanding infiltration rates, a technical appendix might be warranted]*

3.2 WATER RESOURCES

3.2.1 Surface water

Runoff from two distinct watersheds merge at the site of the infiltration project. Pantano Wash drains the eastern end of the Santa Ritas (from an area of about 457 mi^2), Rincon Creek flows westward from the southern portions of the Rincons.(a watershed of 45 mi^2).

Stream flow records (USGS, 2001) reveal runoff patterns altogether consistent with regional climate. When sudden increases in runoff from the respective watersheds happen, they tend to during the summer monsoon season or in the winter months (Figs. 4A and 4B). Both streams are capable of relatively large peak discharges during summer thunderstorms, nearly 600 ft^3/sec and nearly 1400 ft^3/sec in Pantano Wash and Rincon Creek, respectively.

Daily mean discharge for each stream, Q_{avg}, were calculated as 5.9 and 10.1 ft^3/sec for Pantano Wash and Rincon Creek, respectively (Table 1). Each stream has historically spawned runoffs more than 100 times these average discharges. In this arid climate, days with barely a measurable discharge at the respective stream gauges occur more than half the year along Pantano Wash and more than three quarters of the year along Rincon Creek. Daily mean runoffs between 1 and 5 ft^3/sec were measured 37% and 6% of the days, respectively. In effect, the great majority of the time neither stream carries much water, but each can swell quite rapidly when localized runoff becomes very heavy. Standard deviations reflect this inherent seasonal variability, each being about five times the actual daily mean discharge (Table 1).

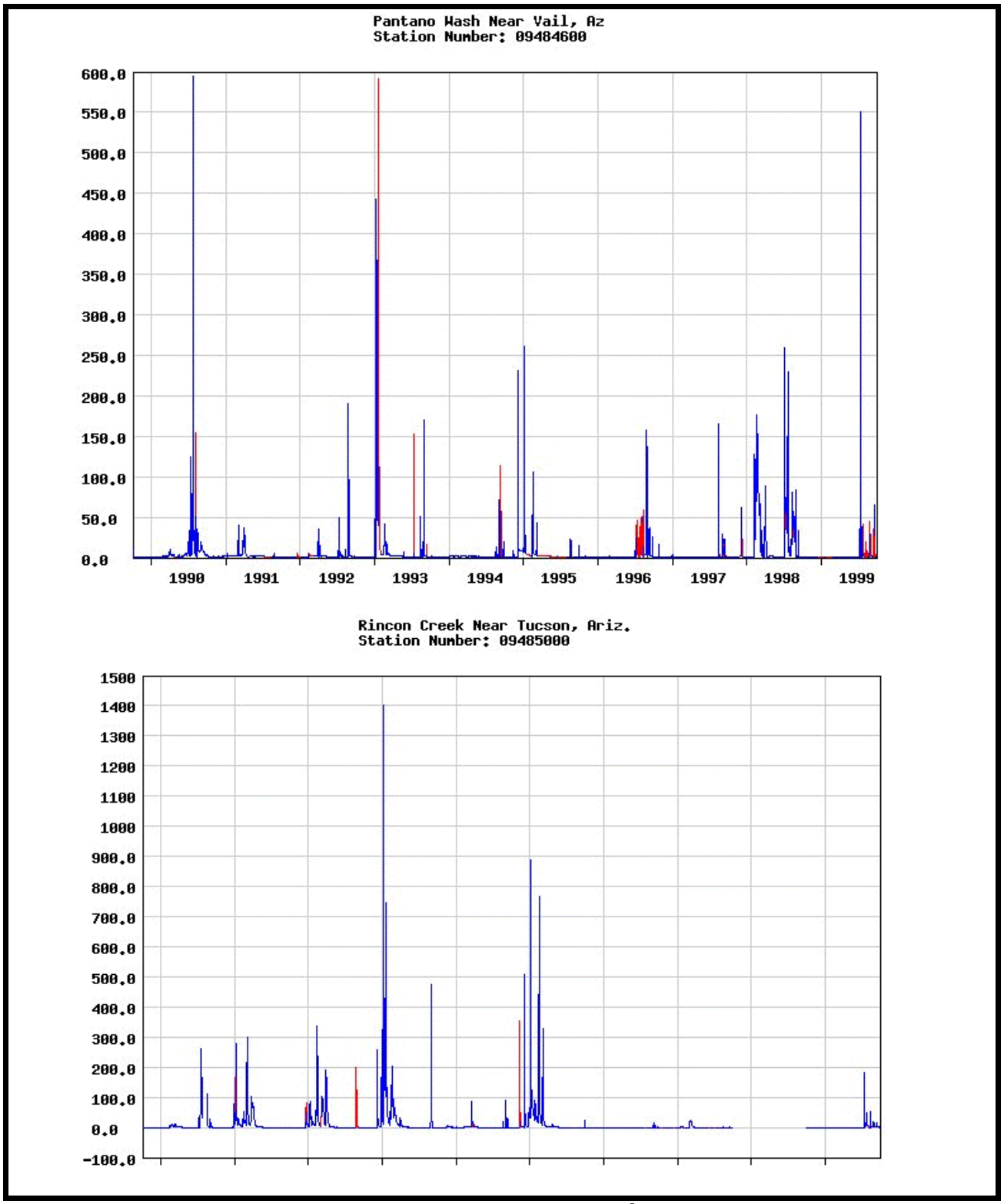


Fig. 4A and 4B. Approximately 10 years' discharge data (ft^3/sec) as recorded by a gauging station on Pantano wash (4A, upper record) and Rincon creek (4B, lower record). Blue lines record measured flows, red lines are estimates.

Table 1 . Stream flow properties of Pantano Wash and Rincon Creek. Maximum daily discharge, q, was recorded in ft^3/sec at a gauging station on each creek (station numbers 09484600 and 09485000, respectively). Q_{avg} measures mean daily maximum discharge, also in ft^3/sec. (Source: USGS, http://az.water.usgs.gov/rtaz/html/rtsw.html).

	span of records	Q_{avg}	standard deviation (also ft^3/sec) and sample size	percentage of days when	
				$q < 1$ ft^3/sec	$1<q<5$ ft^3/sec
Pantano Wash	10/1/89 - 9/30/99	5.9	27.8 (N=3652)	52%	37%
Rincon Creek	10/1/90 - 9/30/99	10.1	56.3 (N=2922)	78%	6%

The lower discharges rarely reach the confluence of the streams. Flood event discharges do, and as altogether typical of this climate can be very turbid. Aside from suspended materials, stream flows through the confluence are not polluted.

3.2.2 Water quality

Neither Pantano Wash nor Rincon Creek now flow year-round. This change of stream hydrology is a consequence of declining water tables throughout the Tucson area.

When runoff does extend from the mountains as far as the confluence, it varies in overall quality. Summer thunderstorms usually bring on flash floods that carry substantial sediment and are therefore turbid. As the discharge peak passes and water velocity slows water becomes clearer. Surface debris, lubricants, rubber decomposition products, and some heavy metals typically associated with tires can be detected upstream where Interstate Highway 10 crosses Cienega Creek, one of the two principal tributaries of Pantano Wash itself. Measurements for these various aqueous contaminants have not been made systematically near the confluence where the percolation field would be constructed.

3.2.3 Ground water

The confluence of the two washes lies within the Tucson Active Management Area (Tucson AMA), established pursuant to the 1980 Groundwater Management Code authorized by the Arizona legislature. Subsurface aquifers here comprise part of a larger complex of groundwater resources termed the Upper Santa Cruz groundwater basin. Groundwater sources within the Tucson AMA yield water with levels of total dissolved solids commonly in the range of 200 to about 500 mg/l (ADWR, 2001).

A well (id. number [D-15-16]17bca) drilled to a depth of 73 m on the point of land between the two washes, effectively immediately upstream of their confluence, was sampled by the Arizona Department of Environmental Quality (ADEQ). Water came from the well at 19.6° C and pH = 6.8, and at total alkalinity equal to 64 parts per million. A second well, downstream of the confluence (# [D-15-16]06aac) reaches a depth of 103.6 m and yielded water at 25.6° C, total alkalinity 109 parts per million. Both wells had concentrations markedly below drinking water standards established by EPA and the State of Arizona for total dissolved solids, sulfates,

nitrites and nitrates combined, arsenic, fluoride, iron, and manganese (Coes, et al., 2000). Although both wells yielded good-quality ground water, statistical analysis shows a demonstrable effect associated with human activities on water quality within the basin (Coes, et al., 1998). *Were this not a demonstration proposed project, these data on subsurface water quality should probably have greater attention and be offered to the reader in more detail. That level of detail fits best in a technical appendix. A synopsis of trends and patterns would reasonably appear in the body of the EA.*

3.3 CLIMATE AND AIR QUALITY

3.3.1. Climate

All the Tucson basin experiences semiarid conditions. Highest temperatures occur in June and July and the lowest in December and January (Table 2). The average rainfall, 12 inches, comes mostly in July, August, and September, when regional weather patterns can induce thunderstorms virtually everyday.

Table 2. Monthly average high, low, and average daily temperature, and precipitation total for Tucson. Data period: 1961-1990. (Information source - http://www.wrh.noaa.gov/Tucson/climate/tus.html

Month	Temperature Normals (deg F)			Precipitation Normals (in)
	High	Low	Average	
January	63	38.6	51.3	0.87
February	67.8	41	54.4	0.7
March	72.8	44.6	58.7	0.72
April	81.2	50.4	65.8	0.3
May	89.9	58	74	0.18
June	99.6	67.9	83.8	0.2
July	99.4	73.6	86.6	2.37
August	96.8	72.1	84.5	2.19
September	95.3	67.5	80.4	1.67
October	84.3	56.6	70.4	1.06
November	72.7	45.6	59.2	0.67
December	64.3	39.8	52	1.07
ANNUAL	**82.2**	**54.6**	**68.4**	**12**

Overall topography of the Tucson basin broadly influences normal wind patterns. The prevailing winds blow from the southwest at an average of about 8 miles an hour.

3.3.2 Air quality

Certain air borne pollutants cause physiologically deleterious effects to humans, presumably other animals, and definitely on plants. The U. S. Environmental Protection Agency (EPA) designates six "criteria pollutants". The ambient concentrations of these substances in the air of a geographic region, measured over defined periods, have become the accepted measure of air quality. Monitoring stations placed in representative areas throughout Pima County and operated by ADEQ record the atmospheric concentrations of: carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and suspended particulates less than ten one-millionths of a meter (a micron, μ) in diameter (usually called PM_{10} because they are smaller than 10 microns in size, 0.00001 m = 10 μm). Provided atmospheric concentrations remain below standards established by the federal and state governments (Table 4), the air of a regional basin would be described as conforming to the air quality criteria specified by the Clean Air Act, as amended. For example, ambient concentrations of ozone in Pima County are generally markedly below the threshold levels recognized as the National Ambient Air Quality Standards (AAQS), and Pima County as a whole has been designated as an attainment area for O_3. In contrast, two Air Planning Areas within Pima County are in "non-attainment" for PM_{10}. In other words, PM_{10} concentrations have exceeded 0.077 parts per million too often.

Table 4. Arizona Department of Environmental Quality (ADEQ) and National primary air quality standards for determining attainment within a regional air planning area of goals established by the Clean Air Act are the same. Three separate Air Planning Areas have been designated in the Tucson Area. The Tucson Air Planning Area (TAPA) is largest, the Rillito Air Planning Area (RAPA), is next in size, and the Ajo Air Planning Area (AAPA) is smallest.

criterion pollutant	averaging time	ADEQ and National standards (parts per million, ppm)	attainment, as of July 10, 2000		
			TAPA	RAPA	AAPA
ozone (O_3)	1 hour	0.12 ppm (235 $\mu g/m^3$)	yes	yes	yes
carbon monoxide (CO)	8 hours	9 ppm (10 mg/m^3)	yes[2]	yes	yes
	1 hour	35 ppm (40 mg/m^3)	yes[2]	yes	yes
nitrogen dioxide (NO_2)	1 hour†, determined from annual arithmetic average	0.053 ppm (100 $\mu g/m^3$)	yes	yes	yes
sulfur dioxide (SO_2)	24 hours	0.14 ppm (365 $\mu g/m^3$)	yes	yes	yes
	1 hour†	0.03 ppm (80 $\mu g/m^3$)	yes	yes	yes
lead and its compounds (Pb)	average over a calendar quarter	0.001 ppm (1.5 μg/m3)	yes	yes	yes
PM_{10}	24 hours	0.077 ppm (150 $\mu g/m^3$)	yes	no	no

†: determined as the annual arithmetic average and expressed on an hourly basis

2: a limited maintenance plan for the Tucson carbon monoxide "non-attainment" area pertains to this Air Planning Area.

The mountains to the north, east, and south of Tucson create a distinct local climate, designated as the Tucson Air Planning Area (TAPA). The proposed project lies entirely within TAPA. Direct emissions if CO from gasoline and diesel engines, and sunlight causing chemical reactions between volatile organic compounds and oxides of nitrogen whose products contribute indirectly to atmospheric formation of CO, previously led to CO concentrations greater than air quality standards. A non-attainment designation applied to TAPA. EPA reviewed a limited maintenance plan for carbon monoxide emissions within TAPA submitted by the Pima Association of Governments, and finding it adequate reclassified TAPA as a CO attainment region on July 10, 2000 (Pella, 2001 ; Comrie, 2001). Effectively, the designation is probationary (Comrie, 2001).

The project area lies within an air planning basin now fully in attainment for all six criteria pollutants.

3.4 NOISE

3.4.1 The scale of sound measurement

Humans perceive sounds in a dichotomous way. Many are inherently pleasant and enjoyable. Noises on the other hand are unwanted and commonly annoying, and typically arise from human activities in a manner which interferes with or disrupts normal activities. Noises carried from a source to the person hearing it most often elicit a sense of annoyance, instead of enjoyment as would distinguish noise from agreeable sounds. Aural perception actually involves a wide spectrum of separate sound frequencies, and these may be at differing intensities. Our percept combines both frequency and loudness as the sound we hear. Sound intensities are typically measured with a device which mimics the uneven sensitivity of our hearing apparatus. Measurements in units of the so called A-weighted scale of decibels (dBA) approximate how humans perceive sounds. For example, normal speech measures approximately 60 dBA at a distance of 5 feet, while the engines of a commercial jet aircraft measure 64 times as loud at a distance of 200 feet, 120dBA.

If of sufficient intensity, both sounds and noise can cause permanent loss of hearing. Permanent hearing loss can occur when average intensities exceed 90 dBA for a period of 8 hours. Auditory damage, not to mention legitimate pain, begins when sound intensities exceed about 120dBA for short times. Hearing loss can occur at sound intensities above 90 dBA sustained over 8 hours. .

3.4.2 Ambient noise conditions

Diesel engines which power the heavy equipment currently used in mining operations generates virtually all the noise emanating from the site. Measurements were made during an extended site reconnaissance on May 12, 2003, at five times throughout the day from a designated spot on Drexel Road approximately 75 feet west of the property boundary (Table 4).

Table 4 . Sound intensity (dBA) recorded from a spot just west of the current aggregate mining business on Drexel Road. Each record is the average of four separate measurements 45 seconds long. Measurements occurred while heavy earth moving equipment was active and often nearby.

5:45 AM	9:45 AM	1:45 PM	4:30 PM	8:00 PM
42 dBA	91 dBA	87 dBA	90 dBA	53 dBA

The changes of background sound levels match daily commercial patterns at the mine: the rise during the day evidently attributable to steady operation of various sorting, moving, loading, and hauling equipment.

Aural sensibilities changed throughout the day, in addition to the sound intensity levels of Table 4. Coyotes conversed among themselves from at least four different places east of the mine before dawn (about 4:30 AM), and by 5:45 when the first sound measurements were made coveys of Gambel's quail were clearly audible somewhere up Rincon Creek, and a Lucy's warbler (*Vermivora luciae*) could be heard calling from a mesquite thicket on the north side of Rincon Creek about half a mile upstream from the project area. The sounds from occasional cars passing crossing Rincon Creek on Old Spanish Trail Road could also be heard, faintly. During early evening hours after work at the mine shut day for the day the soft whinnying sounds of lesser nighthawks (*Chordeiles acutipennis*) After work, common night hawks could be heard up Pantano Wash where birds were hawking insects.

Noise receptors in the vicinity include only the employees of sand and gravel businesses. No residential or other commercial buildings exist with half a mile of the mine.

Noise intensities were measured at two intersections along East Irvington Road, at Kolb Road and three miles farther east at Harrison Road. The sensor was placed on the diagonal in the northwest corner of the respective intersection and 50 feet from it. If the signal permitted, traffic passing through each intersection moved at an estimated speed of 35 to 50 miles per hour, while drivers making a turn slowed at 5 to 10 miles per hour. Sound intensity at each intersection ranged from 65 dBA to 93 dBA, the lower intensity when solitary automobiles passed and the higher coinciding with large diesel powered trucks. In the absence of vehicular traffic, noise levels during business hours were as low as 53dBA.

3.5 Land Use

Alluvial sediments immediately west of the confluence are being extracted for commercial uses and sale. This commercial enterprise follows the general dictates of regional planning as indicated by zoning classification. *Zoning designations would differ in various regions of metropolitan Tucson, and should be described in pertinent detail.* The current operation at the site, doing business as Vail Sands & Aggregates, Incorporated, began in 1987. It now occupies approximately 30 acres. *Some measure of daily yield from the sand & gravel business would help characterize the land use and truck traffic in and out of the site.* The property extends eastward to the center line of Pantano Wash. The western boundary is not prominent, merely a staked line across desert vegetation about 150 feet west of the developed edge of the aggregate mine. *A metes and bounds survey should be summarized.* The aggregate mine has been worked profitably until the last two years when the minable deposits have begun to peter out. The owners anticipate having to cease business within the next two years when the extraction costs will surpass revenues generated from this location. A similar mining operation evidently preceded the current business at the proposed location. County records allude to sands and gravels being dug and trucked from this location in the mid- 1960s.

As a rule, construction needs for the products of sand and gravel mines fluctuate markedly from year to year. Business records of Vail Sands & Aggregates, Inc. exhibit just that sort of annual variability. On a regional scale the consumption of water by the aggregates industry shows a high correlation with overall business demands. Recent annual water use by the industry has varied from 2300 acre-feet in 1991 to as much as 5200 acre-feet in 1995

(ADWR, 2001). *Water usage by the business at the proposed infiltration site would be relevant data.*

The two water courses converge about 1¼ miles west of the western boundary of the East Saguaro Wilderness Area, which comprises the main portion of Saguaro National Park East. Because of the intervening distance and the absence of roads which connect directly, the various commercial aspects of the aggregate business have no influence on recreational use of this designated Wilderness Area and National Park.

3.6 TRANSPORTATION

Urban vehicular traffic of all natures passes along Irvington Road. Commuters use it to enter the air base from the eastern side, and it may carry some traffic toward Tucson Electric Park during professional baseball's spring training season. Commercial and industrial traffic predominate on Houghton and Drexel Roads. *Relevant traffic surveys of major roads in eastern Tucson made by tallying hourly vehicular traffic should be included. They might show Irvington to be of secondary importance in comparison to other east-west roads elsewhere in Tucson.*

3.7 BIOLOGICAL RESOURCES

A general survey was conducted on May 11th and 12th, 2003. The survey included all roads between the air base and the mine, the mine itself, all the desert lands about 150 m to the west of the disturbed surface of the mine, a mile upstream and downstream of the confluence on Pantano Wash, a half mile upstream on Rincon Creek, and two proposed locations on the banks of Tanque Verde Wash where excess materials produced during pipeline construction would be placed.

3.7.1 Vegetation

The working surface of the aggregate mine has been cut down below the native surface of alluvial sediments. In consequence, no native plants grow in the area actively mined. Small patches of relatively undisturbed native soils still remain (Fig. 2) on the east side of the mine, as a buffer against high water. The top and stream side of these patches retain elements of the native plant community. Small creosote bushes (*Larrea tridentata*), a thin scattering of bur sage (*Ambrosia deltoidea*), desert sunflower (*Viquera* cf. *deltoidea*), burroweed (*Isocoma tenuisecta*) and a few 4-winged saltbush (*Atriplex canescens*) remain on the tops. Three ocotillo (*Fouquieria splendens*) have survived on remnant soils at the north end of the infiltration site. Two of the more pernicious alien grasses commonly invading desert communities are here also in low numbers and scattered around the edges of the mine; cheat grass (*Bromus tectorum*) and schismus (*Schismus* cf. *barbatus*). Nearer the wash, some wolfberry (*Lycium* sp.), three greythorn (*Ziziphus obtusifolia*) plants, four blue palo verde (*Cercidium floridum*), and two velvet mesquites (*Prosopis velutina*) still manage to hang on despite the soil disturbance immediately to the west. Along the edge of the wash, an assemblage of species typical for this part Sonoran Desert was noted. Desert broom (*Baccharis sarothroides*) grows in numerous places along the wash's edges, as well as a few catclaw (*Acacia greggii*), seep willow (*B. salicifolia*), scattered burro brush (*Hymenoclea monogyra*) on semistable depositional bars, widely scattered velvet mesquite at the edges, a deciduous salt cedar (*Tamarix* cf. *ramosissima*), tree tobacco (*Nicotiana glauca*), and other non-native weedy species. No saguaros (*Carnegia giganteum*), ironwood (*Olneya tesota*), willows (*Salix gooddingii*), hackberry (*Celtis reticulata*), or cottonwood (*Populus fremontii*) occur within the area to be disturbed by construction for the

receiving basin or spreading channels. No agaves, in particular *Agave palmeri*, grow within the area of potential direct effect.

Notable elements of the natural plant community exist in the general area of the confluence. Saguaros, ocotillo, creosote, foothill paloverde (*Cercidium microphyllum*), and several other typical species flourish on the bajada of the Rincon Mountains, east of the confluence. A mesquite bosque occupies approximately 15 acres of stream bank and adjacent upland on the north side of Rincon Creek half a mile upstream of its confluence with Pantano Wash. Mesquites grow downstream from there, but as more widely scattered individuals without the thicket quality characteristic of denser stands. A deliberate habitat restoration effort has achieved noteworthy results on Cienega Creek, about six miles upstream of the site, with apparent successful reintroduction of riparian species and structural complexity that historically enveloped many stream courses in the Tucson area.

3.7.2 Wildlife

The site visit was conducted between early morning and late evening, which inherently biases against direct sightings of many animals active nocturnally. Indirect evidence of them, and of species not seen by chance speaks to their presence in the area nonetheless. Mourning doves and white-winged doves (*Zenaida macroura* and *Z. asiatica*) were conspicuous. Other birds remarked included red-tailed hawk (*Buteo jamaicensis*), Harris's hawk (*Parabuteo unicinctus*), phainopepla (*Phainopela nitens*), curved-billed thrasher (*Toxostoma curvirostre*), and Gambel quail (*Callipepla gambelii*). Round-tailed ground squirrels (*Citellus tereticaudus*) were active on the uplands. Black-tailed jackrabbits (*Lepus californicus*), antelope jackrabbits (*L. alleni*), and cottontail (*Sylvilagus audubonii*) all made their characteristic evasions (a covert dash among creosote bushes over a circular route) of an intruding biologist. Two lizards were numerous and seen repeatedly in the area; side-blotched (*Uta stansburiana*) and desert whiptail (*Cnemidophorus tigris*). Two individuals of another species, desert iguana (*Dipsosaurus dorsalis*), were noted among creosote to the west of the site. Several packrat nests (*Neotoma lepida*) were discovered. Tracks of coyotes (*Canis latrans*), javelina (*Tayassu tajacu*), and probably a striped skunk (*Mephitis mephitis*) appeared at various places in the sandy bottom of both creeks. Grey foxes (Uro*cyon cinereoargenteus*) evidently frequent the area, as judged by scat piles left on rocks in many places along both washes.

Surface water does not regularly reach as far down slope as this confluence. Species dependent on open water, i.e. all fish, amphibians and many plants, cannot now survive here.

3.7.3 Threatened and endangered species

The US Fish and Wildlife Service (FWS) lists nineteen Sonoran Desert species as warranting protection by the Endangered Species Act (letter from the Service, Appendix A). The State of Arizona recognizes eight (letter from Game & Fish, Appendix A), one of which duplicates the Federal listing.

Ten of those twenty six currently have a known geographic range which of a certainty does not extend anywhere near the area of potential direct effects for this project. Most notable among these, the Sonoran pronghorn (*Antilocapra americana sonoriensis*) once ranged throughout the general region, where mixed Sonoran desertscrub communities covered bajadas and the uplands around washes such as these. The subspecies has been extirpated from much of the historic distribution and now inhabits only portions of the Goldwater impact range, Organ

Pipe National Monument, and Cabeza Prieta National Wildlife Refuge (Luke Air Force Base, 2001) within Arizona. It's current range also extends into the Mexican states of Sonora and Baja California del Norte (Castillo, 1992). Of those sixteen species whose range is less clearly delimited and therefore might occur in the project area (Table 5), nine depend on habitat requirements not afforded them by physical circumstances of this site. Two plant species could inhabit these soils, and five animal species, all volant as it happens, could use resources in this area during part of their respective life cycle.

The entire project area was examined thoroughly in mid-May for the presence of Pima pineapple cactus (*Coryphantha scheeri robustipina*) and tumamoc globeberry (*Tumamoca macdougalii*) by an ecologist quite familiar with plants of the Sonoran Desert. The cactus commonly grows on sandy alluvial soils and bajadas. It was not found anywhere within or adjacent to the areas to be disturbed by construction. One individual was found well beyond the project area limits, but its location shall not be revealed in this report. The globeberry, also a perennial, grows as a vine. It germinates by early April in the shade of larger perennials at the edge of washes below about 3000 feet in elevation, then uses those nurse plants for scaffolding to support its growth form. Seedlings have become well established elsewhere and older plants are fully leaved by the date of this site survey. None were discovered anywhere in Pantano Wash or the lower end of Rincon Creek where direct effects of project construction would occur.

Table 5. Biological species protected by Federal or State rules and whose currently known distribution potentially encompasses any part of the project area.

Common name (scientific name) status[†]	likelihood of presence within area of potential effect based on general habitat needs?
dependent on year round aquatic habitat	
Desert pupfish (*Cyprinodon macularius*)* E	nil
Gila topminnow (*Poeciliopsis occidentalis occidentalis*)* E	nil
Huachuca water umbel (*Lilaeopsis schaffneriana recurva*)* E	nil
dependent on well developed dense riparian or streamside forest habitat	
Jaguar (*Panthera onca*) E	if ever, as an extremely rare transient
Ocelot (*Felis pardalis*) E	if ever, as an extremely rare transient
southwest willow flycatcher (*Empidonax traillii extimus*)* E	nil
upland habitat characteristics	
Cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*)* E	moderate could forage, roost, or nest in the area
Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) E	moderate could forage in the area, but not roost
Nichol's Turk's head cactus (*Echinocactus horizonthalonius nicholii*) E	nil: restricted to limestone soils
Pima pineapple cactus (*Coryphantha scheeri robustipina*) E, HS, S	high on sandy alluvium and bajadas
California leaf-nosed bat (*Macrotus californicus*) WC, S	moderate could forage here, but not roost

Table 5. Biological species protected by Federal or State rules and whose currently known distribution potentially encompasses any part of the project area.

tumamoc globeberry (*Tumamoca macdougalii*)	SR, S	high - along shaded areas in washes and arroyos
greater western mastiff bat (*Eumops perotis californicus*)	S	high could forage here, but not roost
lyre-leaved twist flower (*Streptanthus carinatus*)	S	very low restricted to limestone soils above 5400'
Swainson's hawk (*Buteo swainsoni*)	S	moderate summer migrant, could forage here
Gila monster (*Heloderma suspectum*)	S	uncommon expected only as occasional transient

† E Federally endangered; S declared "sensitive" when occurring on lands managed by U.S. Forest Service; WC Arizona species which is or may be in jeopardy, or whose populations are declining; HS Arizona native plant species in jeopardy of extinction; SR "Salvage Restricted" Arizona native species highly susceptible to theft or vandalism.

* - species for which the Fish & wildlife Service has designated (or proposed) critical habitat.

All three bat species might fly over the area while foraging. The landscape has no features here which would make the area suitable for roosting or nursery colonies. Lesser long-nosed bats are herbivores for the most part, feeding on nectar, pollen, and fruit of some agave species and the larger columnar cactuses. No potential food sources for this species exist on site. The other bats, *Macrotus californicus* and *Eumops perotis*, rely primarily on insects and would reasonably be expected to pass over the infiltration site. All three roost by in caves and the adits or open shafts of mine, and rocky crevices. They also use similar shelter for maternal roosting sites. Swainson's hawk would also forage on occasion in this area, although by day. Absence of any trees at the site precludes their nesting here. Gila monsters probably wander across this site now and again. None were seen during the survey in May. Lacking rocky outcrops, the infiltration site would not afford habitat requirements this reptile needs. It would not normally become the home range for any of the lizards, even juveniles dispersing from their hatching site.

Cactus ferruginous pygmy owl - The plant species and community structure cactus ferruginous pygmy owls typically inhabit does not occur in the immediate area along the confluence sections of the Rincon or Pantano Wash where the infiltration site would be constructed. The site falls within the geographic zone where a moderate likelihood of finding an owl (zone 2) has been identified by the Arizona Game and Fish Department and the US Fish and Wildlife Service. An area of high probability of finding pygmy owls (zone 1) occurs less than 2 miles east of the infiltration site.

A protocol for survey techniques was published jointly by the Arizona Game and Fish Department and FWS (cited as AGFD, 2000). Techniques described there to elicit calls by free ranging pygmy owl were used at four call stations, each about 200 m apart, on each of four dates (Table 6) during the 2003 survey season. One survey station was established at the confluence, a second was located about 200 m up Rincon Creek, a third 200 m upstream from the confluence on Pantano Wash, and the fourth about 250 m downstream from the confluence.

Table 6. Dates and times of protocol survey for *Glaucidium brasilianum cactorum* in the vicinity of the proposed infiltration site during the 2003 survey season.

date	survey times (24 hrs)	lunar phase	ambient temperature ° C	% cloud cover
18 March	0330 to 0615	full	8 to 13	cloudless
16 April	0320 to 0550	full	11 to 14	cloudless
15 May	0345 to 0615	one day before full	18 to 25	10 to 25
21 May	0515 to 0730	gibbous	24 to 28	cloudless

Two survey dates were chosen to coincide with the full moon, because pygmy owls are known to be more active those nights. No pygmy owls responded to recordings played at any of the four call stations on any of the dates. None were seen anywhere in the vicinity during these four surveys.

3.7.4 Designated critical habitat

Critical habitat has either been designated or proposed by the FWS for six species whose recognized range spans the general region: the Huachuca water umbel, desert pupfish, Gila topminnow, southwest willow flycatcher, cactus ferruginous pygmy owl, and the Mexican spotted owl (*Strix occidentalis lucida*). None of these actually encompasses the confluence of the two washes. That of the Mexican spotted owl is probably closest, on the other side of the Rincons facing the San Pedro river and perhaps 10 miles to the northeast.

3.8 Cultural Resources

3.8.1 Regulatory Setting

Cultural resources which a proposed project might affect need to be located before starting the ground disturbing work. There are two principal methods of locating them. One means, a records and literature search, involves examining the archives kept at all appropriate repositories of archeological site records. The search may show that an archeological, or historical survey had been conducted and some cultural resources were identified. The second means comes into play if that archival search showed either (1) that no one had previously surveyed the site, or (2) a previous survey was either out of date or inadequate. In that case a qualified archeologist, will need to carry out a pedestrian surface survey to determine if any cultural resources are within the proposed project boundaries.

After locating and characterizing cultural resources by one means or the other, their significance must be evaluated. The Federal Agency overseeing the undertaking uses a process to determine if the cultural resource is eligible for listing in the National Register of Historic Places (National Register). This process is mandated by Section 106 of the National Historic Preservation Act. Federal Regulation 36 CFR 800 guides it.

Eligibility for listing in the National Register requires resources to meet certain criteria. The resource has to be either minimally 50 years old or exhibit exceptional importance. After meeting the age requirement, cultural resources are evaluated according to four criteria: a, b, c, and d. The National Register criteria for evaluation as defined in 36 CFR 60.4 are: "the quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and

(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
(b) that are associated with the lives of persons significant in our past; or
(c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
(d) that have yielded, or may be likely to yield, information important in prehistory or history.

Once determined eligible for inclusion in the National Register the resource then becomes formally known as a "historic property", its age not withstanding. Historic property status may be applied to individual cultural resources or to a group of cultural resources that are united by a theme or context. The combined historic properties are then designated as either a historic or archeological "district" and the individual elements are called contributors. is accorded the same level of protection as a property that is included.

3.8.2 Cultural setting

Both watercourses would have afforded comparatively easy access to indigenous peoples seeking game or plant materials at higher elevation. Plants gathered from the area also could have been important for baskets. The absence of competent rock surfaces at the confluence and mining site means petroglyphs could not testify to the steady passage of people, as is presumed elsewhere in the Tucson area. More recently, the route now fixed as Old Spanish Trails Road was the chief way of coming and going between Tucson and the San Pedro River, which in turn lead to the grassland steppes of southeastern Arizona. The confluence and both washes are deemed to have high sensitivity for cultural resources (Cushman, 2001).

3.8.3. Project site characterization

An archaeologist for the Corps of Engineers reviewed all literature archived at the Arizona State Museum (ASM), which included all historic topographic maps of the study area pertinent to the area of potential effects and a margin surrounding it 200 m wide. Via the archaeologist with Pima County Technical Services (Mayro, 2001), the Corps was informed of a general designation of high sensitivity for cultural resources for the confluence and both water courses themselves.

ASM records indicated no archaeological sites within the footprint of the proposed infiltration site, nor within half a mile of the confluence of the two washes. Topographic maps (USGS, 1:24,000) dated 1963 do not show the sand and gravel operation, nor does Drexel road appear on these maps. Aerial photographs from 1957 show undisturbed desert terrain where the aggregate mine now exists and no disturbance which would have been a precursor to Drexel Road. The sand and gravel pit and Drexel Road came into existence less than 50 years ago.

County maps published in 1938 show Irvington Road and a then un-named trace which coincides with the current alignment of South Houghton Road. Both these roadways are at least 50 years in age.

The Corps archaeologist completed a systematic and intensive survey of all roads leading to the site, the existing working surface of the aggregate mine itself, the undisturbed desert surface for 150 m around the lip of the existing mine, the confluence and the exposed bank

surfaces of both washes. Visibility of existing surfaces in the area of potential effects surpassed at least 95%.

Scattered prehistoric sherds were found on the remnants of undisturbed surface between the sand and gravel pit and the western bank of Pantano Wash. These occurred sporadically, 10 to 20 m apart, and all were non-diagnostic plainware ceramic fragments of different thickness, temper, sediment size, and inherent color. Aside from bones of contemporary origin, no skeletal material was found on the surface or embedded in the banks. No anthrosols were identified. No locus of artifacts, workable lithic materials, nor lithic fragments was found anywhere within the area of potential effects. Lacking any association between soils which retain human effects and the low density of broken pottery from different sources, surface artifacts do not constitute a definable site, including habitation or tool manufacturing.

The two washes converge in alluvial sediments of Quaternary age. The potential for buried artifacts is high in such a geomorphic setting, especially along the immediate banks which are subject to shifting stream courses and deposition of sediments in the last 10000 years. As a prudent component of the identification phase, subsurface exploration at four locations occurred under direction by archaeologists. These were conducted where spreading channels would pass through the western bank of Pantano Wash (Fig. 2). A backhoe moved alluvial deposits down to the elevation of the wash itself. No buried artifacts or cultural deposits were identified.

The alluvium between South Houghton Road and the western edge of the existing aggregate mine is not subject to redeposition by flood waters coming down Pantano Wash. The geomorphic setting where the water line would be buried along Drexel Road gives a very low potential for buried artifacts in the best professional judgement of the Corps.

Identification concluded with direct consultation between the Corps, State Historic Preservation Officer (SHPO), Pima County, and interested Native American Tribes. Native peoples traversed both washes to reach higher country. Neither the confluence nor the immediate banks were a venue for traditional tribal uses of the land. The native desert surface to the south and west of the aggregate mine holds no tribal importance.

Current mining equipment and operations are thoroughly contemporary and in no way distinctive of extractive sand and gravel mines. Any cultural artifacts or sites which may have preceded the aggregate mine have been completely destroyed by extraction of sands and gravels to a depth at least 8 feet below pre-existing desert surface (and much more in several places), as judged by the lay of the land to the west. Consequently, the site gives no evidence of potentially eligible National Register properties under §106 of the National Historic Preservation Act, as amended (36 CFR 800, *et seq*.).

4. ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

4.1 SOILS AND GEOLOGY

4.1.1 Criterion for evaluation of impacts

Evaluation of foreseeable impacts from a proposed action should weigh any potential to aggravate existing geological hazards, foster new ones, the protection of salient geological features in the project area, and minimization of scraping or grading soils not previously disturbed. The EA would reasonably emphasize any impacts to geologic or soil conditions made unstable by the proposed action, effects on local geological properties which would in turn compromise the structural integrity or functional properties of the project, grade or scrape areas larger than need be for structural or design purposes, foster undue erosion from the project area, or otherwise permanently alter geological features which may have aesthetic, biological, or cultural qualities separate from their physical geological nature.

4.1.2 No Action Alternative

If the decision were made to take no action regarding further use of water from the air base, no trenching would occur along existing roads. The existing surface of the aggregate mine would remain unchanged. Finally, no passageways through the west bank of Pantano Wash to carry water from above into the wash would be constructed.

4.1.3 Percolation Alternative

Excavation of the trench to conceal the water line would occur along existing roads. Irvington Road and South Houghton Road already have asphalt paving, while Drexel is a dirt road. After the pipeline has been set and covered, the existing surfaces would be restored. No permanent change would be evident at the end of construction.

The alignment of the pipe into the aggregate mine would follow surfaces already disturbed for business needs. So also, the receiving basin would be constructed from highly disturbed surfaces (Fig. 2), where sands and gravels are now extracted in the course of business. No alteration of these surfaces would occur, compared to existing conditions.

The shallow flumes would pass, for the most part, over other portions of the existing aggregate mine and thus would not change existing soil surfaces. Where each approaches the west bank of the wash, each channel would require new disturbance of surfaces currently intact. All four channels envisioned by this project would necessitate about 150 linear feet of new grading and shaping. Channels would be 30 feet wide. Novel disturbances of soils to make these channels would equal about 1500 ft^2, approximately 0.03 acres. In view of the pre-existing disturbance to soils at the mine itself, greater than 30 acres, this can be considered a negligible increment.

Functional characteristics of the infiltration basin have the potential for geological changes on a scale broader than the immediate site alone. Ground subsidence caused by pumping from deep aquifers has been documented in many parts of eastern Tucson. Partial recharge of these aquifers from this infiltration site would slow the pace of future subsidence, or possibly even halt it completely in a small region downslope of the washes' confluence.

Mitigation measures - Implementation of the proposed project would not cause adverse local effects to soils, geological features, or geomorphology of the project area. Therefore, mitigation measures are not required.

Environmental Commitments - Predetermined places on the west bank of Pantano Wash would be marked prior to construction. Excavation through the bank to lead the four spreading channels downhill toward the confluence would occur only at those marked locations.

4.2 WATER RESOURCES

4.2.1 Criteria for evaluation of impacts

The analyses of consequences to water resources attributable to the proposed project need to accentuate substantive changes from existing conditions. Adverse effects might reasonably warrant some form of mitigation if the proposed action would:

- diminish the normal seasonal availability of water to existing users,
- contribute to net overdraft from groundwater aquifers,
- degrade water quality or endanger public health by creating or worsening health hazard conditions,
- contravene legal measures which protect and manage water resources.

4.2.2 Surface and groundwater

The volume reaching the infiltration site, 150000 gallons a day, when expressed in more familiar terms turns out to be less than half an acre-foot per day. Even if none of this were to soak through the bottom of the receiving basin and spreading channels, but instead all reached Pantano Wash before it begins to infiltrate, water would flow in Pantano Wash slower than 3 inches per second and would be less than half an inch deep at the maximum. This would be a negligible stream flow by comparison with the runoff from a thunderstorm and, moreover, would not block or deflect or impede such a natural event. By design, the percolation project would not change the movement of natural runoff water through the confluence or downstream of it. Any water flowing down Pantano Wash which might one have reached its juncture with Tanque Verde Wash would still do so.

A sizeable fraction of water delivered to the site should infiltrate directly through the bottom of the receiving pool and the spreading channels which extend from it. Indeed, their serpentine shape is designed to slow the water flow toward the wash and maximize percolation.

4.2.3 Water quality

Water drawn from the Colorado River for the Central Arizona Project contains much sodium, and is generally described as of high salts concentration. Dissolution of trona deposits in southeastern Wyoming contributes much of this sodium, and another notable increment originates from ancient salt beds close to the mouth of the Little Colorado River, downstream from Cameron, Arizona, in Coconino County. Central Arizona Project water arriving in Tucson typically has about 700 mg/l of total dissolved solids (ADWR, 2001). Used water shipped from the air base will have been cleansed of lubricants and particulate solids. These insoluble products would precipitate at the salvage facility and be removed from the export stream by sand filters with other particulate solids. Preliminary tests indicate a potential slight reduction of salt concentrations caused by various chemical reactions with the assorted metals and other components of military aircraft, and a substantial reduction of sodium levels due to the final treatment of wash water at the air base, an ion exchange process. Total dissolved solids in the water delivered to the percolation site are expected to range between 250 and 450 mg/l.

Materials have to be moved around by machinery to build the spreading channels and connect them to Pantano Wash. Approximately 3¼ acres of existing surface of the aggregate

mine would be re-arranged to form the receiving basin, and approximately of an acre would be graded to make the spreading channels. Since less than 5 acres total would be disturbed, neither a storm water permit from the State of Arizona nor a storm water pollution prevention program would be required for the proposed project.

Pushing the native materials around where spreading channels would pass through the west bank of the wash would require compliance with §404 and §401 of the Clean Water Act. The Regulatory Branch of the Corps of Engineers oversees §404 matters, while the State of Arizona administers a Water Quality Certification program as required by §401. The proposed design of the spreading channels, and their linkage with Pantano Wash in particular, is the least environmentally damaging alternative, as dictated by §404. To comply with those safeguards of the Clean Water Act, a Section 4040 (b)(1) evaluation of project effects has been prepared (Appendix C). That evaluation would be submitted to the Arizona Department of Environmental Quality as partial documentation for §401 State Water Quality Certification. Documentation required by the State of Arizona - an application for Water Quality Certification (form 404-015) and a description of means for "protecting water quality during facility construction" (form 404-003) - would also be submitted to ADEQ prior to construction of the proposed project. The latter two forms are also attached (Appendix C).

Filtration of the water leaving the salvage facility at the air base would reduce all potential water contaminants to concentrations below those found at the source of CAP water, but the export to Pantano Wash would still be regarded as process wastewater. Section 402 of the Clean Water Act, namely the National Pollutant Discharge Elimination System (NPDES) Permit Program, pertains to discharge of such process waste waters. Currently, the EPA issues NPDES to applicants in the State of Arizona, although the State has sought authorization to administer the program as provided for under the Clean Water Act. The State Water Quality Certification (§401) would be a necessary component of the NPDES permit. Pima Association of Governments would secure the NPDES permit prior to implementing the project.

Water derived from the CAP would pass through Davis-Monthan and arrive at the infiltration site with fewer impurities than when it was drawn from the Colorado River itself. Its storage and subsequent recovery from subsurface aquifers are specifically exempted from the requirements of an Aquifer Protection Permit (Arizona Revised Statutes §49-250), as codified by Arizona Administrative Code R18-9-101 through R18-9-403. This exemption applies to facilities using CAP water in subsurface reservoirs, such as that created by this proposed percolation site.

The proposed project would have no adverse impact on water quality. It would counteract the historic pattern of water overdraft from subsurface reservoirs, although the net effect of this project, by itself, would only slow the pace of deficit water use, not reverse it.

Mitigation measures - No adverse effects to water quality, supply, or seasonal availability would come about by implementation of this proposed project. Therefore, mitigation measures are not required.

Environmental commitments - Notches through the bank would be built after the summer monsoons have ended in southern Arizona, probably mid-October. All best management practices stipulated by ADEQ would be followed during their construction.

4.3 CLIMATE AND AIR QUALITY

4.3.1 Criteria for evaluation of impacts

Evaluations of foreseeable impacts to climate from the proposed action need to consider how it might change rainfall patterns, seasonal temperatures, average wind speed or direction, and so forth.

Multiple criteria enter the evaluation of impacts to air quality. In accord with criteria recognized by U.S. Environmental Protection Agency the evaluation should emphasize any persistent and adverse impacts to air quality if the proposed project would:

- Cause construction or operational emissions that would result in direct violation of an air quality standard or contribute substantially to an existing or projected air quality violation;
- Cause emissions that exceed any Federal Prevention of Significant Deterioration increment threshold;
- Cause emissions that would exceed thresholds that trigger emission offset requirements under New Source Review;
- Result in non-compliance with the Federal General Conformity Rule (40 CFR Parts 6, 5 1, and 93) requirements. Under Section 176(c) of the Clean Air Act Amendments (CAAA) of 1990, the proponent must make a determination of whether the Proposed Action "conforms" with the State Implementation Plan (SIP). However, under 40 CFR, Section 93.153 (Applicability), if the total direct and indirect emissions from the Proposed Action are below the General Conformity Rule "de minimis" emission thresholds, the Proposed Action would be exempt from performing a comprehensive Air Quality Conformity Analysis, and would be considered to be in conformity with the SIP;
- Cause objectionable odors off site;
- Pose a significant threat to the public health of safety due to potential accidental release of air toxics emissions or acutely hazardous materials.

4.3.2 No Action Alternative

No impacts would occur to regional or local climatic patterns under the no action alternative. Similarly, air quality would not change from existing conditions if the no action alternative were selected.

4.3.3 Percolation Alternative

The Tucson Air Planning Area encompasses all facets of the proposed actions. Because this air basin is in full attainment for all six criteria air pollutants, further determination of conformity to requirements of the Clean Air Act is not required. The proposed project would cause no demonstrable impact to air quality within TAPA.

Proposed actions located in the northwest portion of Tucson or Marana (specifically within the 324 square mile area circumscribed by nine townships: T11S, R9E through R12E, and T12S, R8E through R12E) would lie within the Rillito Air Planning Area. EPA has ruled this air basin to be in moderate non-attainment for PM_{10}. In consequence, an EA would need to present detailed calculations of projected impacts. In the main, these potential air quality impacts would be primarily associated with project grading and construction. Maintenance activities could also be a source of PM_{10} constituent emissions or their precursors and short-term in nature. Impacts from maintenance activities would be described as occurring periodically on a long-term basis. These projections would need to be couched within a recitation of seasonality, severity, and causes of the historic PM_{10} exceedances of air quality standards (Table 3). The arithmetic would account for PM_{10} emissions attributable to all on-site construction activities, those which occur off-site but stem directly from the project itself, stationary sources built as part of the project, and windblown fugitive dust originating from the project area. The sum of those individual

contributions would be stated as an impact. Provided that sum is less than 100 tons per year, the de minimis *threshold established by EPA for General Conformity with the Clean Air Act (40 CFR §93.153), the analysis would conclude that implementation of the proposed action would not adversely affect attainment of the State Implementation Plan and emissions from the project not regionally significant on overall air quality. If that sum were greater than 100 tons/year, mitigation would be required and a Conformity Determination be mandatory.*

Mitigation measures - Implementation of the proposed project would not degrade local or regional air quality in the Tucson Air Planning Area. Therefore, mitigation measures are not required.

Environmental Commitments - Fugitive dust should be controlled to the extent possible by watering spoils piled temporarily along the trench, Drexel road, and the surface of the aggregate mine during construction of the receiving basin and flumes. Construction machinery would be restricted to speed less than 15 miles/hour on dirt roads and at the aggregate mine. Engines and exhaust systems of all motorized vehicles would be kept properly tuned.

4.4 NOISE

4.4.1 Criterion for evaluation of impacts

Analyses of noise impacts on sensitive receptors from a proposed project rely, ultimately, on a subjective evaluation of aural discomfort. People wince at brief noises of unacceptable levels (e.g. 100 dBA standing 3 feet from a gasoline lawn mower engine), and experience impaired hearing from prolonged noise exposure of lower intensity (greater than 90 dBA for an 8 period). An increase of sound intensity to unacceptable noise levels or a greater number of people subject to unacceptable levels of sound would constitute an adverse project impact. Conversely, a reduction in the number of people exposed to unacceptable noise levels could be deemed a beneficial impact of the proposed project.

4.4.2 No Action Alternative

Trenching for the pipeline would be unnecessary. The noise levels commonly recorded at similar construction sites (ordinarily ranging between 85 and 90 dBA standing 50 feet away when bulldozers, front end loaders, graders, dump trucks and such are in steady use) would not occur therefore.

Earth moving machinery would continue in operation at the aggregate mine. Noise levels measured at the site (Table 4) would persist.

4.4.3 Percolation Alternative

Construction of the pipeline along Irvington Road, South Houghton Road, and Drexel Road would entail using the kinds of machinery described above, which broadcast 85 - 90 dBA noise while the engine runs and the equipment does its job. These are comparable to noise levels measured at the aggregate mine. Noise emanates at this intensity from comparable activities throughout urban Tucson as well. Attenuation of noise intensities follows a logarithmic inverse square relationship, and empirically shows a reduction of sound levels by 6dBA each time the distance doubles between source and receptor. Thus, assuming average construction noise levels along these roads equal 87dBA measured 50 feet away, at a distance of 200 feet noise levels

would equal 75dBA. These match intensities people find quite acceptable at outdoor sports arenas. Noise caused by pipeline construction would be short-term at a given location, lasting only the few days necessary to finish the pipeline in that spot before moving on.

A single bulldozer would shape the receiving basin and spreading channels in a day or two. Thus, even with construction at the percolation basin noise levels should drop from those measured in day to day operation of the aggregate mine. Once finished, noise levels would be expected to decline to the ambient background, 45 to 55 dBA, which characterizes the confluence of the two washes.

Implementation of the proposed action would have a salutary impact in reduction of noise levels at the percolation site.

Mitigation measures - Short-term noise levels associated with pipeline construction would not constitute unacceptable noise intensities. By nature of the steady movement of pipeline construction, local temporary impacts would not last more than a day or two. Therefore, mitigation measures are not required.

Environmental Commitments - Trenching, pipeline assembly, backfilling, and repaving would be restricted normal business hours, 7:30 Am to 5:30 PM, Mondays through Saturdays.

4.5 LAND USE

4.5.1 Criteria for evaluation of impacts

The analyses of land-use consequences attributable to the proposed project need to accentuate substantive changes from existing conditions. Adverse effects might reasonably warrant some form of mitigation if:

- they contravene applicable land use plans or policies,
- preclude existing land use in the future, or
- incompatibility with land use of adjacent properties in circumstances which involve public health or safety.

4.5.2 No Action Alternative

No changes from current land use would occur.

4.5.3 Percolation Alternative

Additional infrastructure would be required, in the form of a new pipeline beneath Irvington Road, South Houghton Road, and Drexel Road. Since ample space for other planned underground utilities exists, this proposed action would not impair the future installation or operation of those additional infrastructures.

Implementation of the proposed project would necessitate Vail Sands & Aggregates, Inc. ceasing to do business. Land use would thus shift from a commercial enterprise to an aspect of water management for greater Tucson. Construction and operation of the percolation basin as planned would not be incompatible with current zoning designations regarding this area. Provided a fair market price for the property be offered by PAG to the owners of Vail Sands & Aggregates they would agree to giving up the aggregate mine. The owners cite declining net revenues traceable to operations having nearly reached the bottom of the minable lens of alluvium as an impending economic reason to cease business within the next two years anyway.

Hence, fashioning a percolation would not preclude continued use of the land for its dwindling mineral deposits.

The proposed project would have no impact on land use.

Mitigation measures - Due diligence would be exercised when designing the pipeline and its exact alignment to avoid conflicts with pre-existing underground utilities. Land where notches would be made through the western bank, approximately 0.03 acres in total, would be permanently altered. The very small area involved would not merit compensatory mitigation.

Environmental Commitments - The receiving basin and flumes would be no larger than necessary. The remaining surface of the aggregate mine, approximately 25 acres, would be available for future uses compatible with this infiltration project.

4.6 TRANSPORTATION

4.6.1 Criteria for evaluation of impacts

The analyses of effects on local transportation attributable to the proposed project need to emphasize long-term results. Adverse effects might reasonably warrant some form of mitigation if the project would compromise transportation safety, levels of service which rely on roadways, or prolonged disruption of customary circulation patterns that cause genuine aggravation.

4.6.2 No Action Alternative

No changes in daily or seasonal use of roads in this part of Tucson would occur.

4.6.3 Percolation Alternative

Temporary and minor alteration of traffic patterns would occur. These would probably be greatest along Irvington Road, next largest along South Houghton, and probably scarcely noticeable along Drexel Road. Disruptions at a particular spot would last 2 or 3 days until the pipeline had been completed, backfilled, and the pavement restored. Motorists would have to avoid the right hand lane in the immediate construction area, perhaps 200 yards in length at the most, and exercise greater caution when in the vicinity of construction personnel. Minor traffic delays would be expected as slow-moving equipment goes about its work.

These would be regarded as brief inconveniences, not substantive impacts of the project.

Mitigation measures - After completion of the pipeline in any given area, traffic would revert to normal patterns. In the absence of serious impacts, mitigation measures are not required.

Environmental commitments - Trenches would be covered with steel plates at the end of each work day. Pipeline construction would begin after the end of spring training for major league baseball, and would move from west to east in order to minimize disruption of motorists driving to attend games in Electric Park Stadium.

4.7 BIOLOGICAL RESOURCES

4.7.1 Criteria for evaluation of impacts

The analyses of effects on biological resources attributable to the proposed project need to be considered on multiple levels. Some act directly, but temporarily; some may be direct in

nature and very long-term in duration; others have indirect and temporary consequences; finally, some may be indirect, but of long-term quality. Any of those four general kinds could cause adverse impacts for which mitigation would be necessary. As a rule, the greater any impacts to endangered or threatened species, or to critical habitat upon which listed species depend, the greater the severity of effects attributable to the proposed project.

4.7.2 No Action Alternative

No foreseeable direct effects to species in the area would occur. That is to say, Vail Sands & Gravels probably would not expand the footprint of the aggregate mine beyond its current frontier. It is in the owners' best interest not to break through the remnants of banks between the working pit and Pantano Wash. Commercially extractable deposits do not extend farther west than what is already being mined. Property to the south and the north is not commercially available. Being hemmed in, the owners have no need to clear new land and thus directly affect plants and animals now living in the immediate vicinity.

Noise emanating from the aggregate mine and fugitive dust blown off its surface could potentially lower reproductive success of birds and mammals in the area, or diminish photosynthesis rates by plants on account of dust settling on leaves and blocking sunlight. This level of effect has not been demonstrated and furthermore would only be appropriate for preparation of an Environmental Impact Statement. If such indirect effects of operation of the aggregate mine now take place, then they would likely continue unchanged by a decision to take no action.

4.7.3 Percolation Alternative

No noteworthy biological resources occur in any of the three roadways which the pipeline would follow.

The project would remove plants and animals from the remnants of banks on the west side of the wash where notches would be made. In total, approximately 1,500 ft^2 would be cleared. These spots have an average mix of desert perennials growing on them now, plus the various animals commonly associated with the dirt mounds which form at the base of these plants. These species and their assemblage at the percolation site have no remarkable regional distinctiveness. Permanent loss of the biota in approximately 0.03 acres, incurred by constructing the spreading channels, would not warrant compensatory mitigation.

Two of the three ocotillos happen to be too close to the place where one of the channels would snake down through the bank. Per agreement with the State of Arizona Department of Agriculture, these two ocotillos would be transplanted to suitable soil on the far side of the confluence before construction begins. Four small velvet mesquites, a species afforded a lesser degree of protection under Arizona law, would be removed during construction.

No plants designated Highly Safeguarded in Arizona grow anywhere within the area of potential direct or indirect effect of the proposed project. In like manner, no endangered or threatened species occur here. No impact to biological species considered to be unusually sensitive would occur.

Available water in the desert means life congregating around that water. Since water soaking into the ground cannot help but make the ground wet, desert plants would most likely colonize the immediate area. Animals would follow. Those plants already growing nearby would probably become more lush and verdant over time. The comparatively small quantity of water available before it sinks beyond biological reach into subsurface strata would have the general effect of a small, permanent seep. The periphery of the receiving basin, edges of the

spreading channels and the wash itself for a small area downstream would show the pervasive effects of water in the desert as an indirect consequence of the proposed action. By promoting water recharge underground habitat conditions in a localized area would become more mesic. The effect cannot realistically be estimated in a quantitative or areal way. Prior to region-wide extraction of water from aquifers, this reach of Pantano Wash (and possibly Rincon Creek) would have carried water most of the year, and a subsurface flow would have been present year round except during prolonged regional droughts. The proposed percolation project would promote a return in that ecological direction in a small area around the confluence of the washes. *Historical records of stream flow, photographs showing cottonwoods or cienega, and so forth would be germane in the context of this interpretation of effects.*

Periodic maintenance of the percolation site would be necessary in order to keep the soils porous. In effect, the bottom of the basin and spreading channels would need to be scarified now and again as determined by reduction of infiltration rates. Plants growing in the bottom would be removed and the patterns of recolonization started again.

Implementation of the proposed project would have no effect on listed species. The probable reappearance of mesic habitat in a region of Tucson that historically sustained larger trees and the wildlife associated with that habitat in the desert would constitute a beneficial, indirect effect.

Mitigation measures - Adverse consequences to biological resources are of such a small scale, 0.03 acre, as to be deemed negligible. In consequence, mitigation measures are not required.

Environmental commitments - Two ocotillos would be transplanted by knowledgeable biologists from the construction site to previously identified places on the east side of the wash. They would be moved during a period of dormancy and after the hottest weather has passed for the year; mid-October to mid-November would be optimal. A biologist would be on site during construction to rescue such animals as cannot readily escape from earth moving machinery. The biologist would guide construction of the notches to minimize loss of mesquites, greythorns, palo verdes and wolfberries. Construction of the receiving basin and the flumes would occur after mid-September to avoid any disruption of nesting or fledging by birds in the area of potential effect.

4.8 CULTURAL RESOURCES

4.8.1 Criteria for evaluation of impacts

The analyses of effects on cultural resources attributable to the proposed project also need to be considered on multiple levels. Direct effects for which mitigation could be necessary include:

- physical alteration, damage, or destruction of part or all of an identified resource;
- changes to the character of the surrounding environment which contribute to its inherent uniqueness;
- the presence of elements foreign to the setting and thereby out of character with the resource; neglect which leads to its deterioration or loss.

4.8.2 No Action Alternative

No impacts of any kind would occur to cultural resources if the decision were made not to implement any project.

4.8.3 Percolation Alternative

The area of potential effects around the confluence was intensively surveyed. Neither historic road within the area of potential effects, Irvington Road and South Houghton Road, is eligible for inclusion on the National Register of historic properties. The archaeologist coordinating the cultural evaluation of the project has conveyed that conclusion, and all relevant data, to the State Historic Preservation Officer. Concurrence with the conclusion has not yet been received.

Archival records and the survey of the mine, wash, and adjacent uplands indicate no cultural sites eligible for or already listed by the National Register. Implementation of the proposed alternative would cause no impacts to any properties at the site currently being mined for sands and gravels.

Mitigation measures - A qualified archaeologist would monitor all dirt moving activities at the infiltration site, in particular those four bank notches. Discovery of any buried artifacts, cultural deposits, or skeletal components would necessitate a temporary halt to further excavation and will be evaluated for National Register eligibility in consultation with SHPO, Pima County, and local tribes. The archaeologist would take such action as circumstances warrant according to best professional judgement.

Environmental commitments - Discovery of any cultural resources during ground disturbing activities along the roadways or at the infiltration site would mandate halting all construction site activities until the provisions of 36 CFR §800.13, properties discovered during implementation of an undertaking, have been fulfilled.

4.9 CUMULATIVE EFFECTS

4.9.1 Criteria for evaluation of impacts

The foregoing analyses have described how the proposed action might, or would bring about permanent changes to the existing environment. It does not constitute the sole project in a given area, except in highly unusual circumstances, for the works of man are everywhere. NEPA requires a discussion of the current proposed action in the light of other actions in the general area; those past, those present, and those reasonably foreseeable in the future. The scale of effects shapes this discussion. A comparatively small and isolated project would not reasonably be judged to have synergistic effects with another equally small undertaking quite a ways away. In this matter, a lack of information can seriously cloud the veracity of the discussion of cumulative effects.

Cumulative environmental effects are most likely to be important when some functional relationship between the proposed action and other actions exists. The timing of projects often does not disconnect their cumulative effects, even if no such interaction was intended in either one alone. Similarly, mere recognizing different entities as being responsible for each project likely does not disconnect their cumulative effects. In the end, this overview discussion must touch upon all actions sponsored by assorted agencies (where federal, state, tribal, or local) and persons acting independently. It considers actions completed in the past and now in operation, efforts currently underway, and actions which can be anticipated given the setting.

Mitigations might be in order when:

- a functional (or geographic, etc) relationship exists such that the proposed action might affect or be affected by impacts from other actions;
- if so, does the inclusive analysis reveal cumulative adverse effects which do not stand out when the proposed action is considered by itself?

4.9.2 No Action Alternative

A decision not to implement this proposed infiltration project would result in no action of any kind. By definition, if this proposal were not realized then it could not have interactive effects with other projects. Therefore, no cumulative effect would be possible.

4.9.3 Percolation Alternative

Indirectly, biotic effects of localized changes toward a more mesic microhabitat at the confluence would combine with deliberate restoration of riparian habitat already in place on Cienega Creek. Stream side vegetation growing in distinct islands, here at the confluence and several miles upstream, have the potential of creating wildlife migration corridors closer in nature to what preceded the beginning subsurface overdraughts, disconnected water tables, and the behavioral shift of Pantano Wash and Rincon Creek from gaining to losing streams. Many bird species of the Sonoran Desert especially appear to prosper where riparian vegetation is discontiguous, rather than growing as an uninterrupted and uniform belt. The islands would seem to foster greater structural variability and that, in turn, leads to a greater array of habitat and ecological niches.

The proposed infiltration site would fit in to the much broader plans for conservation and restoration of Sonoran Desert habitat (Pima County, 1998). *This entrée into water and habitat management could easily become an open-ended discussion within cumulative effects. The perceived ecological and resource benefits should be elaborated only to the extent necessary and not treated as an opportunity for policy or positional white paper on regional planning in the Sonoran Desert. The impacts described would arise from permanent changes of existing conditions. In the current climate, they would be deemed salutary rather than adverse and would not require mitigation therefore.*

The proposed alternative would have no perceivable adverse effects on any of the separate categories previously evaluated (§4.1 - §4.8) as a consequence of cumulative interactions with other projects.

Mitigation measures - No mitigation measures would be necessary since no cumulative adverse impacts are anticipated.

5. COMPLIANCE WITH RELEVANT FEDERAL, STATE, AND LOCAL STATUTES, REGULATIONS, AND GUIDELINES

Any proposed action by which something would be built, reconstructed to its original design standards, physically modified in some way so as to work better in conjunction with another project, and so forth may change the existing human environment. This is the standard for judging its foreseeable effects. Congress intended plans, and especially alternatives to accomplish a defined purpose, be evaluated against that standard. An EA asks how the

human environment would change from what exists by implementation of a proposed alternative.

Various pieces of legislation address that human environment in different ways. Some do so overtly and specifically, e.g. the Clean Air Act, others do so more subtly, e.g. the National Historic Artifacts Preservation Act. The EA must present succinctly a credible analysis of foreseeable effects addressed by a legislative or executive directive. The narrative offered by the EA must allow an interested reader to understand from the description of existing environment, the intended action, and the analysis of foreseeable effects how the proposed action would comply with all these relevant directives.

National Environmental Policy Act of 1969 (Public Law 91-190), as amended

NEPA requires agencies of the Federal Government to implement a systematic process of environmental impact analysis to evaluate "major federal actions affecting the quality of the human environment." The Council on Environmental Quality Regulations for implementing the Procedural Provisions of NEPA (40 CFR §§1500-1508), 1978 and revised 1986, guide these evaluations. This Draft EA describes a proposed action which would not cause a level of adverse effect to the human environment sufficiently great as to warrant a more detailed analysis, and therefore complies with the requirements of NEPA of 1969 (42 USC 43221, as amended).

Endangered Species Act of 1973 (Public Law 93-205), as amended

In reply to a request by the Corps for a list of endangered or threatened species which could inhabit the project vicinity, the US Fish and Wildlife Service gave a summary of 19 species (Appendix B). Protocol surveys were conducted for the endangered Cactus Ferruginous Pygmy Owl, as recommended by the Service and the Arizona Game and Fish Department. No evidence of the species or habitat on which this small owl depends was found on site. The proposed alternative would be implemented without affecting any threatened or endangered species. Therefore, the project is in compliance with the Act.

National Historic Preservation Act of 1966, as amended

Design of the proposed infiltration project was reviewed by archaeologists from Pima County. Consultation with tribes in the region also occurred during its planning. The project elicited no concerns for cultural resources from either group.

The proposed project does not yet comply with Section 106 of the National Historic Preservation Act (36 CFR 800) because of two historic roads in the area of potential effect. Formal consultation with the Arizona Office of Historic Preservation has been initiated. The SHPO has not yet written to concur with the evaluation of Irvington Road and South Houghton Road. The delay has been merely procedural, not substantive. Receipt of that written concurrence will fulfill all requirements of Section 106. The proposed project would then be in compliance and could proceed.

Clean Water Act, as amended The Clean Water Act governs how materials may be discharged into or dredged from waters of the United States. Additionally, it governs pollution control and water quality of waterways throughout the U.S. Its intent, in part, is to restore and

maintain the biological integrity of the nation's waters. The goals and standards of the Clean Water Act are enforced through permit provisions. Sections 401 and 404 of the Clean Water Act pertain directly to the proposed project.

A request for § 401 Water Quality Certification from the State of Arizona Department of Environmental Quality (ADEQ), form 404-015, accompanies this Draft EA (Appendix A). Additionally, ADEQ water quality form WQMS - 404 003 appears in Appendix A. As part of ongoing coordination with Arizona Department of Environmental Quality, both forms have been submitted in compliance with ADEQ requirements. Before construction may begin the State of Arizona must issue a Certification for § 401 Water Quality.

Application for and receipt of an NPDES permit by the Pima Association of Governments, either from EPA or the State of Arizona, would be required before water could begin to flow to the infiltration site. Receipt of this permit would satisfy § 402 of the Clean Water Act.

Section 404 outlines the permit program required for dredging or filling the nation's waterways. To comply with § 404 of the Clean Water Act, a 404(b)(1) analysis has been prepared (Appendix A). Section 230. 10(a)(2) of the 404(b)(1) guidelines states that "an alternative is practicable if it is available and capable of being done after taking into consideration costs, existing technology and logistics in light of overall project purpose."

The proposed action would comply with all provisions of the Clean Water Act.

Clean Air Act, as amended

Section 118 specifies that any Federal activity which may result in discharge of air pollutants must comply with Federal, State, interstate, and local requirements respecting control and abatement of air pollution. Section 176 requires that all Federal projects conform to Environmental Protection Agency-approved or promulgated State Implementation Plans.

The Tucson Air Planning Area is in full attainment for all six criteria pollutants, hence the proposed infiltration project does not have to demonstrate conformity to state and Federal Implementation Plans. Use of water trucks will minimize fugitive dust from construction areas. No residual decrease of air quality will persist after construction ends. The proposed construction will not demonstrably permanently degrade air quality in the immediate area or the broader air basin of the Tucson area. The proposed action would comply with the Clean Air Act.

Fish and Wildlife Coordination Act (Public Law 85-624)

The USFWS, the Arizona Department of Game and Fish, and the Corps mutually coordinated the design, construction, and probable effects of this proposed action. The three agencies agreed its implementation would alter wildlife habitat on the west bank of Pantano Wash by the creation of four semi-permanent spreading channels leading from the aggregate mine into the wash, and therefore formal evaluation of it by the Service is appropriate. The USFWS wrote a Draft Coordination Act Report (CAR). After the Corps sent formal comments regarding that Draft document the Service finished preparation of the CAR (Appendix B), in compliance with this Act.

Migratory Bird Treaty Act

The proposed project would not involve the taking, killing, harming, or possession of birds protected under the Act. The project is, therefore, in compliance.

Executive Order 11990, Protection of Wetlands

Wetlands protection includes avoidance to the maximum extent possible of long and short term adverse impacts arising from destruction or modification of wetlands and undertaking new construction in wetlands. The proposed project would neither begin construction nor maintain a pre-existing project in wetlands. Therefore, it would comply with the Executive Order.

Executive Order 11988, Floodplain Management

Under this Order, the USACOE shall avoid actions which would develop the base (100-year) floodplain unless it is the only practicable alternative; reduce hazards and risks associated with floods; minimize the impact of floods on human safety, health and welfare; and consider actions to restore and preserve the natural and beneficial value of the base floodplain. This proposed project would restore natural infiltration processes, and may promote the natural re-establishment of some riparian species in this limited area. Therefore, the proposed action complies with this Executive Order.

Executive Order 12898, Environmental Justice

This Executive Order requires Federal agencies to analyze the impacts of federal actions on minority and low-income populations. The proposed action described by this EA would be accomplished in accord with plans which do not discriminate on the basis of race, color, or national origin, and therefore complies with this Executive Order.

Executive Order 13045, Protection of Children from Environmental Health and Safety Risks

Federal actions which may disproportionately affect health and safety conditions of children are the subject of this Executive Order.—By intent of Executive Order 13045 Federal agencies must, to the extent permitted by law and appropriate and consistent with the agency's mission, identify and evaluate ways a proposed action could have disproportionate effects on children, and then revise alternatives determined to have potentially adverse implications for children. In compliance with this Executive Order, the proposed infiltration project would have no foreseeable effect on any age group in the region, neither children nor adults.

1980 Ground Water Management Act

As implemented by the Groundwater management Code of Arizona, the Tucson Active Management Area needs to achieve a "safe yield" from aquifers by the year 2025. This mean groundwater withdrawal from an aquifer must equal or be less than rates of recharge back to that aquifer. The proposed project would return Central Arizona Project water to groundwater stores in southeastern Tucson. The project would comply with this Arizona statute.

Arizona Native Plant Law

This Law provides various levels of protection to many plants native to Arizona. The proposed action would not affect any plants designated as Highly Safeguarded under the Native Plant Law, but some plants provided a lesser degree of protection, including mesquite, would be removed. Sensitive plants will be avoided or relocated where possible. The Law also requires

notification to the Arizona Department of Agriculture prior to removal of protected native plants. The Arizona Department of Agriculture will be notified as required. The proposed infiltration project complies fully with this Arizona statute.

Aquifer Protection Permit

Use of CAP water for this percolation facility confers a statutory exemption from this State requirement. Pima Association of Governments would need informal coordination with the Arizona Department of Environmental Quality, but a permit itself would not be necessary for full compliance.

Sonoran Desert Conservation Plan Interim Land-Use and Development Review Policy

The Pima County Board of Supervisors promulgated this directive in April 2001. Among other provisions, it stipulates reports contain results of surveys to determine presence and extent of pygmy-owl habitat, results of surveys for pygmy-owls themselves where suitable habitat exists, and results of presence/absence surveys for habitat for any of the 56 species designated by the Sonoran Desert Conservation Plan as priority for planning considerations and vulnerable to habitat loss.

The proposed project complies with the first two directives cited above. It is not in compliance with the third.

6. LIST OF ORGANIZATIONS AND PERSONS CONSULTED

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Mr. Douglas Towne

Arizona Department of Water Resources
Mr. Al Ramsey

Pima County Department of Environmental Quality
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Pima County Archaeology
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7. RECIPIENTS

A list of all people and entities to whom the EA was sent has to be included.

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APPENDICES

Introduction. The following evaluation is provided in accordance with Section 404(b)(1) of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500), as amended by the Clean Water Act of 1977 (Public Law 95-217). Its intent is to succinctly state and evaluate information regarding the effects of discharge of dredged or fill material into the waters of the United States. As such, it is not meant to stand alone and relies heavily upon information provided in the Environmental Assessment (EA) to which it is attached. Citations in brackets [] refer to expanded discussion found in the EA, to which the reader should refer for details.

1. PROJECT DESCRIPTION

a. **Location**. A sand and gravel mine currently operated just west of the confluence of Pantano Wash and Rincon Creek is the site of a proposed percolation project. The confluence occurs at N 32° 8.9′, W-110° 46.8′ (T15S R16 E Section 17) [Fig. 1A and 1B].

b. **General Description**. The proposed action will move Central Arizona Project water from Davis-Monthan Air Force Base via a new pipeline to the sand and gravel mine. A portion of the land now operated as the mine will be converted to a receiving basin and aquifer recharge site. Spreading channels, inclined very slightly and designed to carry water slowly, will lead from the receiving basin toward Pantano Wash [§2].

c. **Authority and Purpose**. Pima Association of Governments authorized the proposed project. If implemented, it would function as a groundwater recharge site.

d. **General description of Dredged or Fill Material**

(1) General Characteristics of Material. Quaternary alluvium, composed largely of clean gravels and sands with occasional silts excavated from four notches to be made through the western bank of Pantano Wash. [§3.1]

(2) Source Of Material. All materials would be excavated from an existing bank. The bank is a variable height above the stream bed, between 5 and 12 feet high.

(3) Quantity of Material. Approximately 60 cubic yards (y^3) of alluvium would be excavated.

e. **Description of the Proposed Discharge Sites**. Materials dug from the bank to make passage ways through it would be disposed of in Pantano Wash. The river bottom is coarse sands, as typical of seasonal washes in the Sonoran Desert. Except during storms, the wash is usually dry.

f. **Description of the Disposal Method**. Construction at the percolation site would be accomplished in a matter of days between mid-October and mid-November. Materials dug from the bank would be spread uniformly and thinly over unvegetated areas of the wash.

2. FACTUAL DETERMINATIONS

a. **Physical Substrate Determinations**. Construction of the project would result in disposal of alluvium derived from the bank into the wash. The bank materials have a greater range of gradation compared to the coarse sands of the wash.

b. **Water Circulation, Fluctuation, and Salinity Determinations**. The Proposed action water have negligible effects on water velocity and water surface elevations. No significant effect on circulation would occur. The proposed action will not significantly affect salinity, water chemistry, clarity, color, odor, taste, dissolved gas levels, nutrients, or eutrophication of water in Pantano Wash.

c. **Suspended Particulate/Turbidity Determinations**. Construction would occur after summer monsoons have ended. No surface flows would be present in the wash at that time. The project would not alter turbidity when Pantano Wash next carries runoff from the Rincon Mountains toward the Santa Cruz River.

d. **Contaminant Determinations**. No contaminants would be introduced into Pantano Wash as a result of the project. The material to be disposed of is native alluvium and uncontaminated. It's source will be the bank in the immediate area of the disposal site. For all intents and purposes, this disposal would do little more than hasten natural erosion of the very same bank.

e. **Aquatic Ecosystem and Organism Determinations**. Pantano Wash and Rincon Creek are both ephemeral. Water may be present during and after rainstorms, but otherwise the washes are dry. No permanent aquatic community exists at the site. The project will not affect any aquatic organisms or aquatic ecosystem.

f. **Proposed Disposal Site Determinations**. The project would not violate any applicable water quality standard and would not affect human use of the riverbed.

g. **Determination of Cumulative Effects on the Aquatic Ecosystem**. The percolation project would be expected to create a localized mesic region of the wash. Various plant species adapted to such habitat conditions may colonize the percolation site. Wildlife would congregate at the site, and probably make greater use of the confluence as a migratory corridor.

h. **Determination of Secondary Effects on the Aquatic Ecosystem**. The proposed infiltration project would have no discernible hydraulic effects. Sediment transport would remain unchanged, as would peak discharge from storm runoffs and average daily discharge. Since no functions attributable to aquatic organisms or ecosystems occupy this site, no secondary effects would result from the project.

3. FINDING OF COMPLIANCE FOR THE PERCOLATION PROJECT

a. No significant adaptations of the guidelines were made relative to this evaluation.

b. No feasible alternative was available that would have had a lesser impact on the project area.

c. The proposed project would not violate any applicable state water quality standards or the Toxic Effluent Standards of Section 307 of the Clean Water Act.

d. The proposed project would not harm any endangered species or their critical habitat [4.7].

e. The proposed placement of fill material will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife will not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values will not occur.

On the Basis of the Guidelines, the Proposed Disposal Site(s) for the Discharge of Dredged or Fill Material is specified as complying with the requirements of Section 404(b)(1) of the Clean Water Act with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic and riparian ecosystems [§6].

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Date: 30 March 2003