

TOWN OF PARADISE VALLEY
INDIAN BEND WASH IMPROVEMENTS

REPORT

July 23, 1976

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TOWN OF PARADISE VALLEY
INDIAN BEND WASH IMPROVEMENTS

REPORT

July 23, 1976



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Coe & Van Loo
Consulting Engineers, Inc.
4550 North 12th Street
Phoenix, Arizona 85014

1 AN ORDINANCE OF THE MAYOR AND COMMON COUNCIL OF
2 THE TOWN OF PARADISE VALLEY, ARIZONA ADOPTING
3 AND PROMULGATING REGULATIONS GOVERNING THE USE
4 OF LAND BETWEEN THE ENCROACHMENT LINES OF THE
5 INDIAN BEND WASH

6 BE IT ORDAINED by the Mayor and Common Council of
7 the Town of Paradise Valley, Arizona as follows:

8 Pursuant to Sections 1024 (5) and 1101 (u) of the
9 Zoning Ordinance of the Town of Paradise Valley, Arizona, the
10 following "Regulations Governing the Use of Land Between the
11 Encroachment Lines of the Indian Bend Wash" are hereby
12 adopted, promulgated, and approved:

13 REGULATIONS GOVERNING THE USE
14 OF LAND BETWEEN THE ENCROACHMENT
15 LINES OF THE INDIAN BEND WASH

16 Section 1. Definitions

- 17 A. Channel: A relatively depressed strip of land which is
18 to be used to carry water flowing along the
19 Indian Bend Wash in the Town of Paradise Valley.
- 20 B. Encroachment Area: The land between the encroachment lines
21 of the Indian Bend Wash in the Town of
22 Paradise Valley, as such encroachment
23 lines are defined and may be modified
24 pursuant to Section 1024 (5) of the
25 Town Zoning Ordinance.
- 26 C. Fill: A deposit of earth material placed by artificial means.
- 27 D. Grading: Any excavating or filling or combination thereof.

28 Section 2. Purposes of these Regulations

29 The purposes of these Regulations are to (a) provide
30 for flood control along the Indian Bend Wash by providing for
31 channelization of the Wash, and (b) develop the land between
32 the encroachment lines as a green belt wherein the land is
devoted to primarily recreational uses, and (c) to permit
certain types of uses of this land that are otherwise prohibited
because of the danger of flood damage, all pursuant to Section
1024 of the Town Zoning Ordinance.

1 Section 3. Limitations Upon Land Use

2 A. Pursuant to Section 1024 (5) of the Town Zoning Ordinance,
3 the Indian Bend Wash shall be developed as a green belt within
4 the Town of Paradise Valley. It shall be channelized in substantial
5 compliance with the Report, Plans, and Specifications of the "Town
6 of Paradise Valley Indian Bend Wash Improvements Report, July 23,
7 1976" prepared by Coe and Van Loo Consulting Engineers, Inc., as
8 certified as such documents by the Paradise Valley Town Clerk, and two
9 copies of these documents shall be maintained in the Town Hall by
10 the Town Clerk for inspection and copying by the public during
11 regular business hours. No building, structure, or construction
12 of any type shall be permitted between the Indian Bend Wash
13 Encroachment Lines as shown on Plate 7 and Plate 8 of Volume
14 One of the Indian Bend Wash Report prepared by the United States
15 Army Corps of Engineers in 1964, unless such building, structure,
16 or construction is authorized by a Special Use Permit issued
17 pursuant to Section 1101, Subsection (u), of the Town Zoning
18 Ordinance, and complies with these Regulations. Any such
19 Special Use Permit shall require as a
20 condition precedent to the construction of any building or
21 structure that the grantee of the Special Use Permit channelize
22 or cause the channelization of the Indian Bend Wash, or maintain
23 such channel, as provided by Section 1024 (5), supra, at the
24 expense of the grantee in a manner prescribed by the Town,
25 to be determined by the size, location, contours, and topo-
26 graphy of the subject property, and the use to be made of the
27 subject property. The design of such channel improvements
28 shall provide for the conveyance of the 100-year frequency
29 storm runoff with a water surface elevation not in excess of
30 that shown in the "Town of Paradise Valley Indian Bend Wash
31 Improvements Report", supra, and shall be authorized only
32 if approved by the Flood Plain Board of the Town of Paradise
Valley, after review by the Town Engineer. The applicant requesting
a change in the encroachment lines, supra, has the burden of

furnishing to the Flood Plain Board, Town Engineer, Maricopa County
Flood Control District, and the U. S. Army Corps of Engineers
1 detailed engineering plans that evidence proper care has been
2 taken to match the water surface specified for their property
3 in the "Town of Paradise Valley Indian Bend Wash Improvements
4 Report", supra, and preserve the flood carrying capacity of
5 the Indian Bend Floodway and said construction will not create
6 a flood hazard to adjoining properties or the proposed
7 improvements. The Flood Plain Board shall be the only authority
8 authorized to establish and/or change encroachment lines
9 within the Town of Paradise Valley.

10 B. It shall be unlawful to place or construct any building,
11 structure, equipment, vehicle, accessory or instrumentality
12 which will raise the water surface elevation of
13 flood waters tributary to or within the encroachment area.

14 C. As a condition of granting a Special Use Permit pursuant
15 to Section 1101 (u) of the Town Zoning Ordinance, the Town
16 of Paradise Valley may require that (1) the grantee construct
17 and subsequently maintain a bicycle path and/or an equestrian
18 trail, and (2) that such a path and/or trail be dedicated as
19 an affirmative easement for public use as a bicycle path or
20 equestrian trail, and that (3) lands immediately adjacent
21 to such a path or trail be landscaped in a designated manner
22 and then be maintained as open space and landscaped as designated.

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1 Section 4. Special Uses Permitted

2 A Special Use Permit may be granted pursuant to
3 Section 1101 (u) for the following uses, buildings or structures
4 only:

- 5 A. Archery
- 6 B. Arts or crafts display or exhibition
- 7 C. Bicycle trail
- 8 D. Equestrian trail
- 9 E. Golf course, golf putting greens, or a pitch-and-putt type of
10 golf course
- 11 F. Horseshoe or quoit pitching game
- 12 G. Jogging path
- 13 H. Lake or pond
- 14 I. Picnic grounds
- 15 J. R-43 Single Family Residential Use, as provided and defined
16 in Article IV of the Town Zoning Ordinance and, if applicable
17 Chapter 6 of the Code of Ordinances of the Town of Paradise
18 Valley
- 19 K. Single Family Residential Use, as provided by Section 2104
20 of the Town Zoning Ordinance and Chapter 6 of the Code of
21 Ordinances of the Town of Paradise Valley
- 22 L. Sports - non-commercial facilities for playing any of the
23 following non-professional sports: badminton, baseball,
24 basketball, football, shuffleboard, soccer, softball,
25 volleyball or any non-commercial sport approved by a Special
26 Use Permit
- 27 M. Tennis courts or tennis practice backboards

28 Section 5. Application Procedures

- 29 A. All applicants for a Special Use Permit authorized by
30 Sections 1024 (5) and 1101 (u) of the Town Zoning Ordinance
31 shall comply with all requirements and procedures set forth
32 in the Town of Paradise Valley Planning and Zoning Commission
Rules and Regulations, and in particular, Section I (B) 3 of

1 the Planning and Zoning Commission Rules and Regulations.
2 B. In addition to the requirements of subsection A, supra,
3 all applicants for a Special Use Permit authorized by
4 Sections 1024 (5) and 1101 (u) of the Town Zoning Ordinance
5 shall submit to the Planning Director/Zoning Administrator
6 the following at or prior to the time of filing of an
7 application for a Special Use Permit:

- 8 1. A topographic map of the area of the land to be subject
9 to the proposed Special Use Permit with a scale of not
10 less than one inch per 100 feet of existing terrain
11 with contour intervals which clearly depict the nature
12 of and variations in the terrain.
- 13 2. A grading plan for the land to be subject to the Special
14 Use Permit and any adjacent areas which will be
15 graded or affected by the proposed grading.
- 16 3. A report on lateral drainage patterns by a registered
17 civil engineer in order to determine any hydrologic
18 hazards.
- 19 4. Locations of proposed affirmative easements for bicycle
20 paths and equestrian trails.

21 Section 6. Special Design Standards

- 22 A. Roadways shall have curbs with a below grade depth of not
23 less than eighteen (18) inches.
- 24 B. Bicycle paths shall be constructed of concrete or asphalt.

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27 Section 7. Final Inspection and Approval Required

- 28 A. Upon completion of the construction or improvements authorized
29 by a Special Use Permit granted pursuant to Section 1101 (u)
30 of the Town Zoning Ordinance, the Special Use Permit grantee
31 or his agent shall request a final inspection by the
32 Planning Director/Zoning Administrator, to determine com-
pliance with Town law and these Regulations. The Town

1 Engineer shall assist and advise the Planning Director/
2 Zoning Administrator in the final inspection, which shall
3 take place not less than fifteen (15) days after the final
4 inspection request is received by the Planning Director/
5 Zoning Administrator.

6 B. If the Planning Director/Zoning Administrator, upon his
7 final inspection of the construction or improvements,
8 determines that applicable Town laws and these Regulations
9 and the terms and conditions of the Special Use Permit have
10 all been complied with, the Planning Director/Zoning
11 Administrator shall formally approve in writing the con-
12 struction or improvements.

13 C. It shall be unlawful for any person to use or occupy any
14 construction work product or improvements authorized by
15 a Special Use Permit granted pursuant to Section 1101 (u)
16 of the Town Zoning Ordinance unless such construction work
17 product or improvements have been approved pursuant to
18 subsection B, supra.

19 Section 8. Severability

20 Should any portion of these Regulations be held to be unenforce-
21 able or invalid by a final and binding adjudication, such a
22 determination shall not affect the balance of the provisions
23 hereof.

24 Section 9. Regulations Available to the Public

25 Three copies of these Regulations shall be kept by the Town
26 Clerk and shall be available to the public for inspection and
27 copying during regular business hours at the Paradise Valley
28 Town Hall. Copies of these Regulations shall be available
29 for sale at a cost of \$1.50.

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PASSED AND ADOPTED by the Mayor and Common Council
of the Town of Paradise Valley, Arizona, this 12 day
of August, 1976.

J. Duncan Brock, Vice-Mayor

Attest:

Mary Ann Brines, Town Clerk

APPROVED AS TO FORM:

Roger A. McKee
Roger A. McKee, Town Attorney

TOWN OF PARADISE VALLEY
INDIAN BEND WASH IMPROVEMENTS
FINAL REPORT

A. PURPOSE

This report has been prepared at the request of the Town of Paradise Valley, for construction of a broad depressed unlined channel for Indian Bend Wash to control the flow from a 100 year storm and permit the recovery of some land areas now in the flood plain. It defines the minimum channel requirements to satisfy the stated needs of the Town.

B. CRITERIA

As the basis of design certain criteria were established by the Town as follows:

1. The existing drop structure in Camelback Country Club Golf Course will remain.
2. No changes will be made within the golf course property (east of a line one quarter mile east of Invergordon Road).
3. As a general criteria, the basic design width would be a maximum of 800 feet at the top with 20:1 side slopes.
4. So far as practicable the channel will be largely in cut section. There will be no dikes and the edges of the flood plain will be filled only to the extent there will be little or no interference with side drainage.
5. No study or consideration is to be given to means of disposal of excess excavation.
6. A comparatively small pilot channel will be constructed in the channel to handle small flows. *rec frequency 1000 cfs*
7. Culverts will be provided at the crossing at Invergordon Road and Double Tree Ranch Road. The culverts are to be capable of passing up to 1000 cfs without the flow overtopping the road. Concrete box culverts will not be used. *possibility of plugging & expense of water.*

8. It will be assumed that this improvement will meet the proposed Indian Bend Wash Improvement north of Mountain View Road in City of Phoenix limits. *Consurrence by Phx.?*

9. The Corps of Engineers' 4 foot contour interval topography will be used for all design work without additional surveys.

10. It will be assumed that the channel will be grass lined and will be mowed so that average height of vegetation will be 6 inches or less.

C. SUMMARY AND CONCLUSIONS

1. A channel section with a 610 foot bottom width and 10:1 side slopes will handle 22,000 cfs flow established by the Corps of Engineers for a 100 year flood. For the most part the depth of the main channel would be about 5 to 6 feet below existing ground. The edges of the bottom would be about 0.75 foot higher than the center. The top width would be somewhere around 700 feet.

2. 20:1 side slopes could be provided if desired but this would add about 100 feet to the right-of-way width required without significantly changing other characteristics.

3. Stage construction is feasible only if started at the downstream end because this design contemplates lowering the water surface. If an intermediate section were to be built utilizing the existing unimproved cross section as the outfall, the present theoretical water surface would not be lowered appreciably.

4. If the channel is to be constructed in stages, a temporary transition section about 1,000 feet long will be needed to connect the excavated section to natural ground.

5. The transition slope will be comparatively steep and in the event of a flood there will be scour in the transition section and possibly upstream. In addition there probably will become deposition in the fully excavated channel. This condition will exist to some degree no matter what the length of the transition. Consequently this is the price of stage construction.

6. Unless some type of drop structure is provided for the local washes entering the channel, these washes will scour ultimately to a grade connecting to the bottom of the channel.

7. Because of a lack of head and because of the need to handle varying sizes of floods, it is not feasible to construct a completely satisfactory culvert at the two road crossings and the connecting pilot channel.

8. The skew crossing of the channel of the two main road crossings requires comparatively long culverts. The crossing of Invergordon Road skews about 32° from 90° . It would require about 65 feet of culvert along the centerline for a 54 feet wide road; in other words the culvert length will be increased about one quarter from the normal. Similarly the crossing of Double Tree Ranch Road (which is about 61° from right angle) for the same criteria would require 111 feet of culvert or about 2 times the right angle distance. It will not be practical to turn the culvert to cross the roads at right angles. Turning the Double Tree Ranch Road crossing so that it will be about 31° from right angle will require about 63 feet of culvert or about one and one quarter times the right angle distance. Culvert crossings will take care of future widening of roads to two lanes in each direction.

9. The selected culverts are 31" x 50" corrugated metal arch pipe culverts with a paved invert. Invergordon Road crossing will require 20 pipes and Double Tree Ranch Road crossing will require 18 pipes.

10. As an alternate to turning the pilot channel, it will be also possible to relocate the alignment of Double Tree Ranch Road so the culverts will not cross the road at such a flat angle. A relocation of this road probably would result in significant saving, in order of \$45,000.

11. Utilities must be relocated at both of the culvert crossings, i.e. Double Tree Ranch Road and Invergordon Road. Also a 12" water line on 56th Street must be rebuilt. Whether the cost of these relocations must be borne by the Town or by the utilities requires a legal determination.

12. The total excavation required consists of 1,000,000 cubic yards. The excavation cost at \$.30 per cubic yard is estimated to be \$300,000. This estimate does not include disposition. *our experience 45 to .55 /cy.*

13. Approximately 364,000 cubic yards of material can be used in the filled areas east and immediately west of Invergordon Road and south of Mountain View Road. The cost of placing and compacting this material is not included as it can be construed as a property improvement presumably by the owner.

14. The cost for the street crossings is estimated as follows including 28 feet of paving, flush curbs serving as cutoff walls and slope paving of the outlet side.

Invergordon Road

Culvert	\$ 59,939.00
Street	26,643.50
Utilities Relocation	<u>8,000.00</u>
Total	\$ 94,582.50

Double Tree Ranch Road (as proposed, about 31° from a right angle)

Culvert	\$ 57,528.80
Street	42,842.50
Utilities Relocation	10,000.00
Conc. Cap over Sewer Line	<u>1,350.00</u>
Total	\$111,721.30

Double Tree Ranch Road crossing at about 61° from a right angle will cost about \$155,000. The proposed Double Tree Ranch Road crossing will save about \$43,300.

15. The total estimated cost excluding disposition of excavation is as follows:

Excavation	\$300,000.00
Grass Lining	335,000.00
Invergordon Road Crossing	94,582.50
Double Tree Ranch Road Crossing	111,721.30
Water Line Relocation at 56th Street	14,000.00
Engineering & Contingency	<u>85,530.00</u>
Total	\$940,834.18
Say	\$941,000.00

mlce by whom 7

16. The channel alignment has been selected to place the channel in a location as near as practicable to the natural center of the channel. A lateral displacement of the channel from that shown will have little effect hydraulically but may affect construction quantities.

17. The selection of the channel location indicated on the drawings does not mean there are not other locations which could be equally justified for public policy or legal reasons.

18. Within limits the channel alignment may be altered without having a significant effect on costs.

D. HYDRAULICS

The hydraulic analysis for an entrenched soft bottom channel within a 700 foot floodway in Paradise Valley was based on a flood plain in close agreement with an unpublished study made by the Corps of Engineers, dated June 1974.

In developing the invert slopes for a stable subcritical flow for discharge of 22,000 cfs upstream from Berneil ditch system, the Corps of Engineers' criteria was also used. This resulted in a trapezoidal channel with a base width of 610 feet and side slopes of 1 on 10. No channel improvements were considered within the Camelback Golf Course, and the point of beginning the downstream excavation is at Station 78+50 which is at the west edge of the golf course one quarter mile east of Invergordon Road.

Final water surface studies were completed using Manning's coefficient "n" values of 0.035. The maximum velocity for peak flow of 22,000 cfs will be about 7 to 8 feet per second.

Final plan and profile was completed using horizontal scale of 1" = 200' and vertical scale of 1" = 5'.

The new profile indicates the final invert slopes of the main channel as well as the invert slopes of the depressed low flow channel. The variations in depth of the low flow channel are in response to the culverts that must be accommodated.

The required discharge for the low flow or pilot channel is to be 1000 cfs. It would have a base width of 108 feet and side slopes of 1 on 4. The normal depth for this discharge is approximately 2.00 feet, but the excess excavation is necessary due to the dip crossings at Invergordon Road and Double Tree Ranch Road. These crossings will take twenty 31" x 50" corrugated metal arch pipes at Invergordon Road, and eighteen at Double Tree Ranch Road.

The downstream terminal point of the low flow channel is an existing depression which is an extension of a side drain approaching Indian Bend Wash from the north at approximately Station 78+50. Downstream for a distance of about 50 feet from this depression, there is another parallel depression that extends the full width of Indian Bend Wash with a depth of approximately 15 feet.

In all cases, however, the hydraulic control for water surface profiles is the existing drop structure in Camelback Country Club at Station 65+50, with a base width of 700 feet and crest elevation of 1308.0 to 1309.0.

The upstream alignment of the main channel from Double Tree Ranch Road to Mountain View Road was based on the proposed alignment of Indian Bend Wash north of Mountain View Road, the existing topography and the extended downstream reach.

The presentation of this project as described above in Paradise Valley is our recommended design for a feasible floodway from the existing drop structure in Camelback Country Club Golf Course, Station 65+67, to Mountain View Road, a distance of 10,365 feet or 1.96 miles. That part north of Mountain View Road lies in the City of Phoenix and will be constructed under the jurisdiction of that city.

E. CHANNEL ALIGNMENT

Essentially the proposed channel was located following the low area of the cross section. In other words the channel was located as near as practicable to the same general area where a comparatively small flow would run. This location was made on the assumption that this would be the proper location for the channel. The basic reason is that under natural conditions water would flow most often in this location so it is also the property most affected by the existing wash. Where the existing channel cross section is uniform (i.e. where the side slopes have the same slope), this would be in the center of the flood plain.

However, if the bottom is not in the center of the flood plain the constructed channel would be offset.

The recommended location within Phoenix adjacent to Paradise Valley was selected in this manner. However, just before the channel enters Paradise Valley a flat curve is needed to connect to the channel similarly selected in Paradise Valley. There is a 50 foot difference in the top widths of the two channels, i.e. 650 feet more or less for Phoenix and 700 feet more or less for Paradise Valley. The differences in channel widths can readily be accommodated by an appropriate transition.

In establishing the channel location as shown herein it should be emphasized the location was based on topography alone. We deliberately avoided looking into ownerships so we do not know who is involved or what the sizes of the parcels are. The final location can be adjusted laterally to accommodate the various conditions assuming the property owners involved are in agreement. The hydraulics will not be affected by such changes, although excavation quantities might, assuming there are no radical or abrupt changes. A legal opinion on the appropriate location would be in order.

Similarly if for legal policy or other reasons a change of alignment is desired from that shown herein, the hydraulic gradient will be affected very little. Unless radical changes are made, the design proposal herein will be affected very little, if at all.

F. CULVERTS

Each of the road crossings would require long culverts.

Those on Invergordon show about 32° from a right angle crossing and those on Double Tree about 61° . Culvert length at Invergordon Road can be shortened by relocating road alignment or by turning the pilot channel. Plans were prepared by turning the pilot channel so that the culvert would be about 31° from a right angle.

Allowing 27 feet roadway width in each direction and 9" headwalls, the total pipe lengths for each pipe at Invergordon Road and proposed Double Tree Ranch Road crossing would be about 65 feet. Because of the expense of headwalls, it would not appear desirable to build the culverts to other than a permanent width.

31" deep by 50" wide corrugated metal arch pipe culverts with paved inverts would require about a 1.5 foot drop in water surface through the culverts with 1000 cfs passing through the 18 sections at Double Tree Ranch Road and 20 sections at Invergordon Road required.

To accommodate the loss at Invergordon and Double Tree Ranch Road it would be necessary to construct the upstream headwall about 4 feet high.

In both cases it should be recognized that brush may accumulate at the upstream end of the culverts so there would be no guarantee they would carry 1000 cfs.

Because of the extra length of culvert required for Double Tree Ranch Road, consideration should be given to realigning the road to provide a crossing more nearly at right angles.

G. ROADWAY SECTION - WASH CROSSINGS

The two roadway crossings (Invergordon and Double Tree) would be built to match the level of the channel bottom as nearly as practicable except at the culvert. An 18" deep curb section flush with the pavement should be provided at each edge of the pavement to prevent it from being scoured. Pavement should also be placed between the edges of the pavement and the culvert headwalls. On the downstream side a short section of the pilot channel should be paved to protect against scour. Small vertical pipes or markers should be placed along the headwalls at intervals as warnings and by appropriate striping as depth indicators.

Without benefit of specific soil tests at the crossings but based on tests in the general area, it appears the base course will be 10" as per City of Phoenix Standards for major streets. The width will in part be subject to the width prescribed for the culverts.

H. UTILITIES

At each of the road crossings existing utilities will need to be lowered. These include telephone, water and a TV cable. A determination should be made to determine who will be responsible for the relocations.

There is a 15" diameter sewer at the Double Tree crossing. The culverts will barely clear the sewer. The sewer under culverts will need to be encased in concrete and 4 sewer manholes will need to be adjusted to a new road grade.

The 12" water line along 56th Street must be rebuilt.

J. STAGE CONSTRUCTION

Obviously it would be advantageous to develop the channel in stages. Preferably any single property owner should be able to develop his property independently of the others. This essentially is the manner in which Scottsdale was able to construct its greenbelt channel.

The Scottsdale portion of Indian Bend Wash, however, has a significantly different design concept; i.e., the hydraulic gradient (water surface) was not changed appreciably from the preconstruction condition. Thus it was possible for any single property to be developed without affecting the water level on the neighboring properties.

In the manner specified for this study the hydraulic gradient has been lowered to ground surface so far as practicable. This means that to be effective the property downstream has to be developed first or concurrently. Otherwise the water surface at the downstream end of any development would be at the preconstruction level and the new channel would be of little benefit.

It is also evident that the water surface immediately upstream from a new portion of the channel would also remain at its preconstruction level. Thus there would be a drop of several feet in the level of the water surface. Ideally a transition several thousand feet long would be needed to connect the excavated portion to natural ground. A long slope would not be greatly different from the bottom slope of the excavated section so there would be similar velocities in the two sections.

As a practical matter, a long slope could affect several property owners and would probably not be feasible.

A transition of 1000 feet in length would more than double the bottom slope and scouring velocities could be expected. At least part of the eroded

material probably would be deposited in the finished channel section where the velocities are lower. So long as it is clearly understood that a transition length of 1000 feet may result in scouring and deposition, we feel this is a practical approach. Further it is entirely possible that there would not be sufficient flow to create a problem before the channel is completed.

As another alternative a concrete drop similar to that in the Camelback Golf Course could be built. However, the expense of this structure would be prohibitive, and if these were required, we see little opportunity of constructing the channel.

K. SIDE DRAINAGE

There are a number of washes and swales which empty into the present Indian Bend channel. These will continue to do so with the added problem that the excavation of the channel will create a substantial drop where each swale or wash enters. This drop will create erosive velocities which ultimately will result in substantial deepening of the present washes and swales. Ultimately the deepening will work its way upstream until the channel is again stabilized.

It is recommended that riprap drop structures be constructed at the ends of these drainageways where they enter the main channel.

*add to
cost*

L. FILL AREAS

The only area contemplated to be filled is that on the east side and immediately west of Invergordon Road and the area south of Mountain View Road. While the details of how that fill is to be placed should remain with the ultimate developer of that property, the general statement can be made that filling within the limits indicated will permit the recovery of property in the present flood plain without detriment to other owners. In fact it will be advantageous in that it will help create a more uniform flow in Indian Bend Wash. Needless to say such filling must be done in such a manner that side drainage flowing through the property to be filled will not be blocked. Specifically channels will need to be provided so that water entering the property from each wash will reach the main stream. No purpose will be served by specifying at this time the manner in which the side flows are to be carried through the property. This will be controlled in part by the manner in which the property is developed.

M. DRAWINGS AND COMPUTATIONS

The following drawings, computations, special provisions and estimation are submitted with this report and are to be considered part of the report.

1. Floodway Plan - 3 sheets
2. Profile
3. Cross Sections
4. Cross Sections showing Plan and Profiles of Invergordon Road and Double Tree Ranch Road.
5. Computation Sheets
6. Specifications
7. Cost Estimate