

October 15, 2008

Red Point Development  
8710 North Thornydale Road  
Tucson, Arizona 85742

Attn: Mr. Larry Kreis  
General Manager



Consulting Engineers & Scientists

Terracon Consultants, Inc.  
355 S. Euclid, Suite 107  
Tucson, Arizona 85719  
Phone 520.770.1789  
Fax 520.792.2539  
www.terracon.com

**RE: Supplemental Recommendations to Geotechnical Engineering Report  
Phase I Residential Development at the Pines  
At the Pines Golf Course  
North of Cortaro Road and West of Interstate 10  
Marana, Arizona  
Terracon Project No. 63045225, Addendum 10, Revision 1**

Terracon has completed the geotechnical engineering report for the Residential Development at the Pines (Terracon Project 63045225, dated December 8, 2004). Between June 2005 and July 2008, nine addendums to the geotechnical report were provided. Two of these addendums addressed pavement recommendations for Continental Links Drive. The remainder primarily addressed a portion of the property where fills between 7 and 27 feet deep exist. Alternative recommendations to mitigate problems arising from potential settlement of this fill were provided.

These recommendations applied to the lots in the area of deep existing fills. These lots included:

Lot 1	Lot 16	Lot 73
Lot 2	Lot 17	Lot 74
Lot 3	Lot 18	Lot 75
Lot 4	Lot 19	Lot 76
Lot 5	Lot 70	Lot 77
Lot 6	Lot 71	Lot 78
Lot 15	Lot 72	Lot 115

We have been requested by Red Point Development to evaluate the possibility of overexcavating and recompacting the loose fill soils in these areas, to depths we believe sufficient to reduce potential structural settlements to levels where an economical foundation design may be feasible.

The deepest fills estimated to be between 17 and 27 feet are expected at Lots 71 to 77. In the areas of Lots 1 to 4, 17 to 19, 70, 78, and 115, we anticipate the depth of fill to be between 10 and 17 feet. In the areas of Lots 5 and 6, 15 and 16 we expect depth of fill between 5 and 10 feet.

The following table shows the depth of overexcavation and recompaction of existing fills we recommend for these areas.

<b>Area</b>	<b>Depth From Existing Grade (ft)</b>
Lots 1 - 4	10
Lots 5 and 6	5
Lot 70	10
Lots 71 - 74	15
Lot 78	10
Lots 75 - 77	15
Lots 15 and 16	5
Lots 17 - 19	10

The attached Figures 1 through 6 show these areas and cross sections of our recommended overexcavation zones. Soils overexcavated and recompacted as engineered fill should be placed in loose lifts not exceeding 12-inches in height, and should be compacted to a minimum of 95 percent of Standard Proctor Density (ASTM D698) near optimum moisture content.

The cross sections indicate access ramps down into each of the excavations with inclinations of about 3.5:1 (horizontal:vertical). These slopes would not need to extend across the entire side of a given excavation, but rather be wide enough to accommodate the excavation equipment. The remainder of that side of the excavation may have slopes as steep as 1:1 (horizontal:vertical). Also, we understand some of the ramps as shown on our cross section may need to be relocated to other portions of the excavations due to existing site walls.

We understand that additional fill will be required due to compaction shrinkage factors and the desire to elevate the finished grades of the lots above their current elevations. All fill imported to the site should meet the requirements for imported fill provided in the original geotechnical report, and should be compacted according the recommendations in the original report.

If these earthwork preparations are completed as recommended, the following criteria for post-tensioned slab-on-ground foundations may be used for design.

**Post-Tensioned Slab Foundation Systems (Compressible Soil Case):** Post-tensioned slab construction can be considered as an alternate foundation system for the project. Post-tensioned slabs should be designed using criteria outlined by the Post-Tensioning Institute<sup>1</sup> for the compressible soil case based on the following:

- Maximum Allowable Bearing Pressure (at surface)..... 1250 psf
- Soil Modulus of Elasticity,  $E_s$  ..... 3000 psi
- Soil Modulus of Subgrade Reaction,  $k$  ..... 200 pci
- Total Soil Movement,  $\delta$  ..... 1 inches\*
- Slab-Subgrade friction coefficient,  $\mu$ 
  - on polyethylene sheeting..... 0.75
  - on cohesionless soils ..... 1.00
  - on cohesive soils ..... 2.00

\*Estimated settlement based upon total structure load expressed as a uniform 1250 psf pressure acting over the entire slab area. For structure loads resulting in a pressure less than 1250 psf, a reduced  $\delta$  value could generally be estimated by linear interpolation.

Post-tensioned slabs, thickened or turn-down edges and/or interior beams should be designed and constructed in accordance with the requirements of the Post-Tensioning Institute and the American Concrete Institute. Perimeters of the post-tensioned slabs should bear a minimum of 12 inches below adjacent grades. Subgrades supporting a post-tensioned slab should be prepared as recommended in this report.

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<sup>1</sup>PTI Slab-on-Ground Committee, (2004), *Design and Construction of Post-Tensioned Slabs-on-Ground*, Post-Tensioning Institute, Third Edition.

Phase I Residential Development at the Pines  
Pines Golf Course  
Terracon Project No. 63045225, Addendum 10, Revision No. 1

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If you have any questions regarding this letter please contact us.

Sincerely,

**TERRACON**

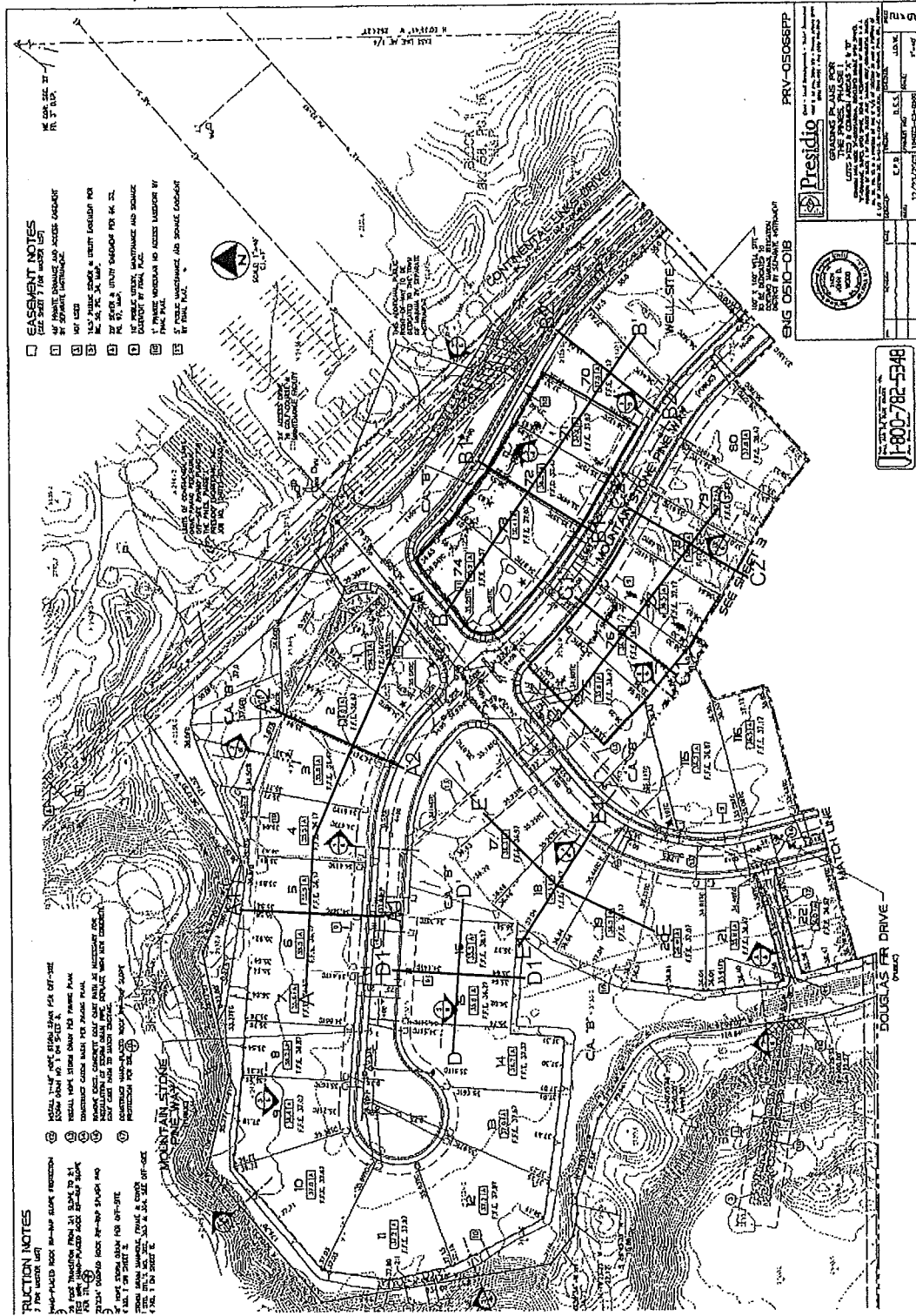


**Expires 03/31/2009**

Oleg B. Lysyj, P.E.  
Principal

Copies:        Addressee (2)

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- EXCAVATION NOTES**
- 1. EXCAVATION SHALL BE TO THE FINISH GRADE SHOWN ON THIS PLAN.
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  - 20. EXCAVATION SHALL BE TO THE FINISH GRADE SHOWN ON THIS PLAN.

- TRACTION NOTES**
- 1. EXISTING CONCRETE SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 2. EXISTING ASPHALT SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 3. EXISTING GRAVEL SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 4. EXISTING UTILITY SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 5. EXISTING FOUNDATION SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 6. EXISTING STRUCTURE SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 7. EXISTING DRIVEWAY SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 8. EXISTING WALKWAY SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 9. EXISTING PATIO SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 10. EXISTING PORCH SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 11. EXISTING DECK SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 12. EXISTING STAIRS SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 13. EXISTING RAMP SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 14. EXISTING ELEVATOR SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 15. EXISTING ESCALATOR SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 16. EXISTING LIFT SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 17. EXISTING HOIST SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 18. EXISTING CRANE SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 19. EXISTING DERRICK SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.
  - 20. EXISTING TOWER SHALL BE REPAIRED TO ORIGINAL FINISH GRADE.

**Presidio**  
 CONSULTING ENGINEERS AND SCIENTISTS  
 1000 N. GILBERT AVENUE, SUITE 100  
 TUCSON, ARIZONA 85719  
 TEL: 520.733.2222 FAX: 520.733.2222

**ENG OSIO-OIB**  
 PROJECT NO. 17-021-0001  
 DATE: 10-05-08

**PRV-0505IPP**  
 PROJECT NO. 17-021-0001  
 DATE: 10-05-08

1-800-782-5348

FIG. No. 1

SITE PLAN  
 OVER EXCAVATION CROSS SECTION  
 THE PINES PHASE I  
 LOT LAYOUT  
 ARIZONA

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 Consulting Engineers and Scientists  
 100 S. GILBERT AVENUE, SUITE 100  
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Project No.	65045225
Scale	NO TO SCALE
File No.	65045225
Date	10-05-08

Drawn By	OBL
Checked By	JNH
Approved By	OBL

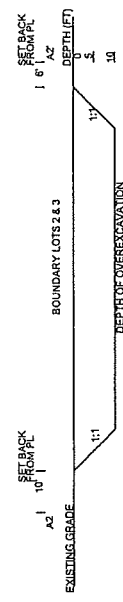
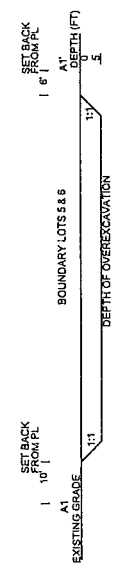
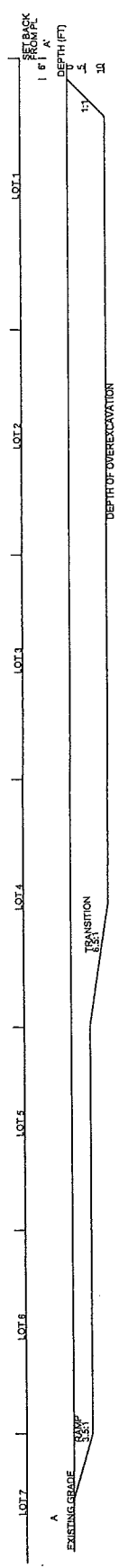


FIG. No. 2

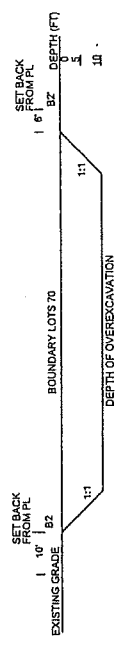
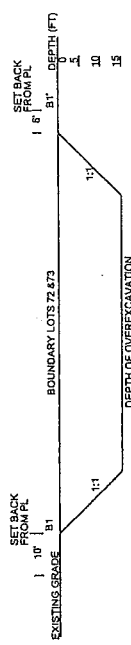
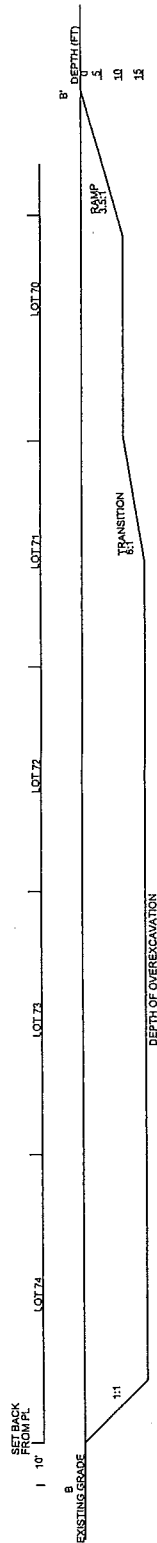
SITE PLAN  
OVER EXCAVATION CROSS SECTION  
THE PINES, PHASE I  
A SECTIONS  
ARIZONA

**Terracon**  
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298 S. EQUUS, SUITE 307  
TULSON, AZ 85719  
PH: (520) 763-1189 FAX: (520) 763-3478

Project No.	63045225
Scale	1"=30'
Date	10-05-08

Prepared By:	OBL
Drawn By:	JNH
Checked By:	OBL
Approved By:	OBL

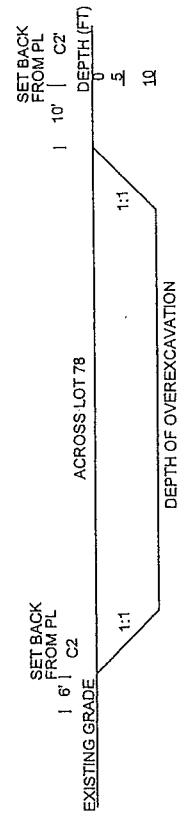
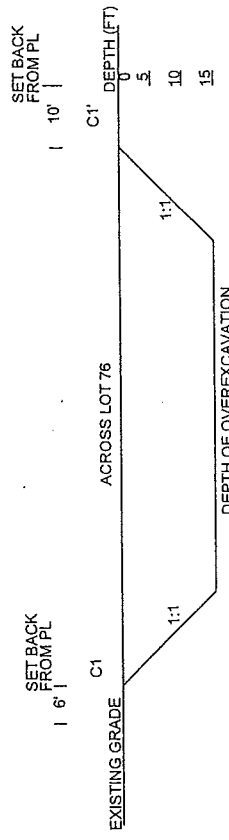
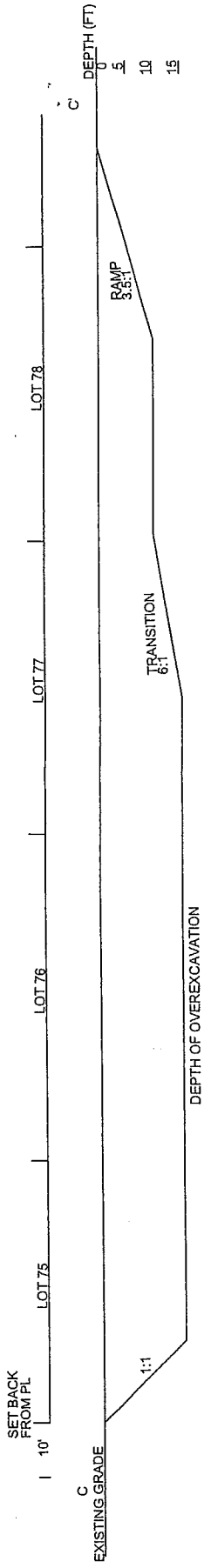
TULSON



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Checked By	OBL	Date	10-05-08
Approved By	OBL		

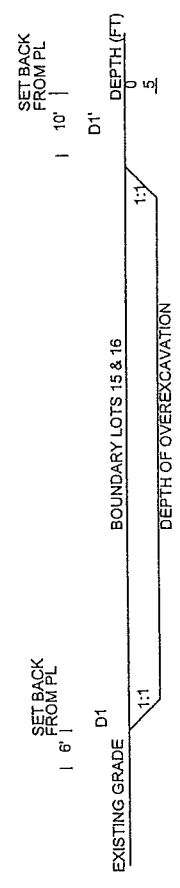
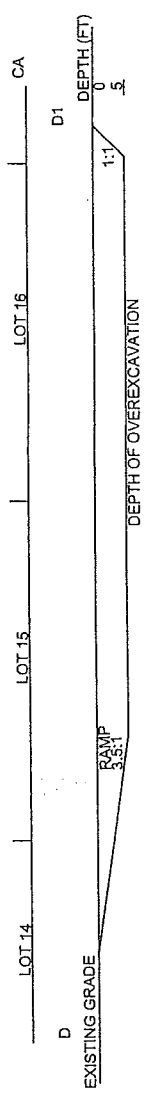
  

<b>Terracon</b> Consulting Engineers and Scientists 305 S. GILSON, SUITE 87 TUCSON, AZ 85710 PH: (520) 776-7700 FAX: (520) 776-5352		TUCSON ARIZONA
SITE PLAN OVER EXCAVATION CROSS SECTIONS THE PINES, PHASE I B SECTIONS		FIG. No. <b>3</b>

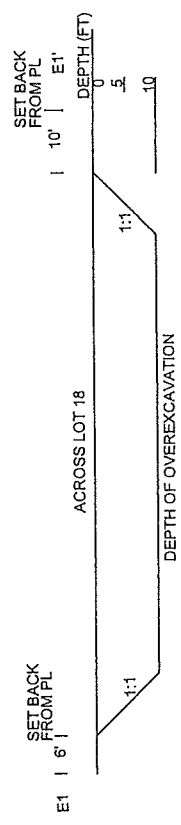
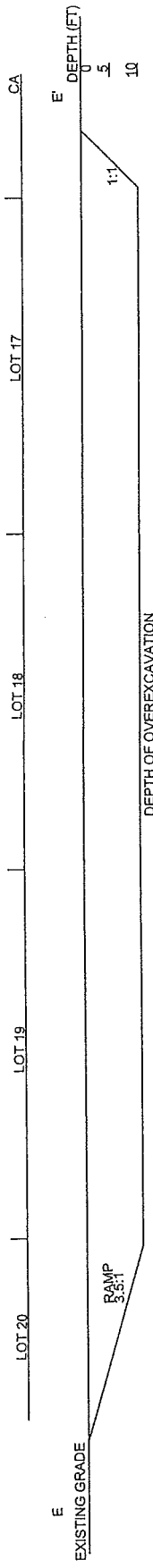


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Project Description:		THE PINES, PHASE I	
Project Address:		C SECTIONS	
Project City:		TUCSON	
Project State:		ARIZONA	
Company Name:		Terracon	
Company Address:		333 S. ORACLE, SUITE 307	
Company City:		TUCSON, AZ 85718	
Company Phone:		FAX: (520) 793-3347	





Project User:	OBL	Project No.:	63045225	FIG. No.:	5
Drawn By:	JNH	Scale:	1"=20'	SITE PLAN	
Checked By:	OBL	Plan No.:	63045225	OVER EXCAVATION CROSS SECTIONS	
Approved By:	OBL	Date:	10-05-08	THE FINES, PHASE I D SECTIONS	
			TERRACON Consulting Engineers and Scientists 385 S. EUGENIE, SUITE 107 TUCSON, AZ 85719 PH: (520) 776-1199 FAX: (520) 763-9497 TUCSON ARIZONA		



	<b>Terracon</b> Consulting Engineers and Scientists 200 S EMERALD SUITE 107 TUCSON, AZ 85718 PH: (520) 775-1799 FAX: (520) 775-5540	PROJECT No. 63045225 SCALE 1"=20' CHECKED BY: CBL APPROVED BY: CBL	FIG. No. 6 SITE PLAN OVER EXCAVATION CROSS SECTIONS THE PINES PHASE I E SECTIONS TUCSON ARIZONA
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