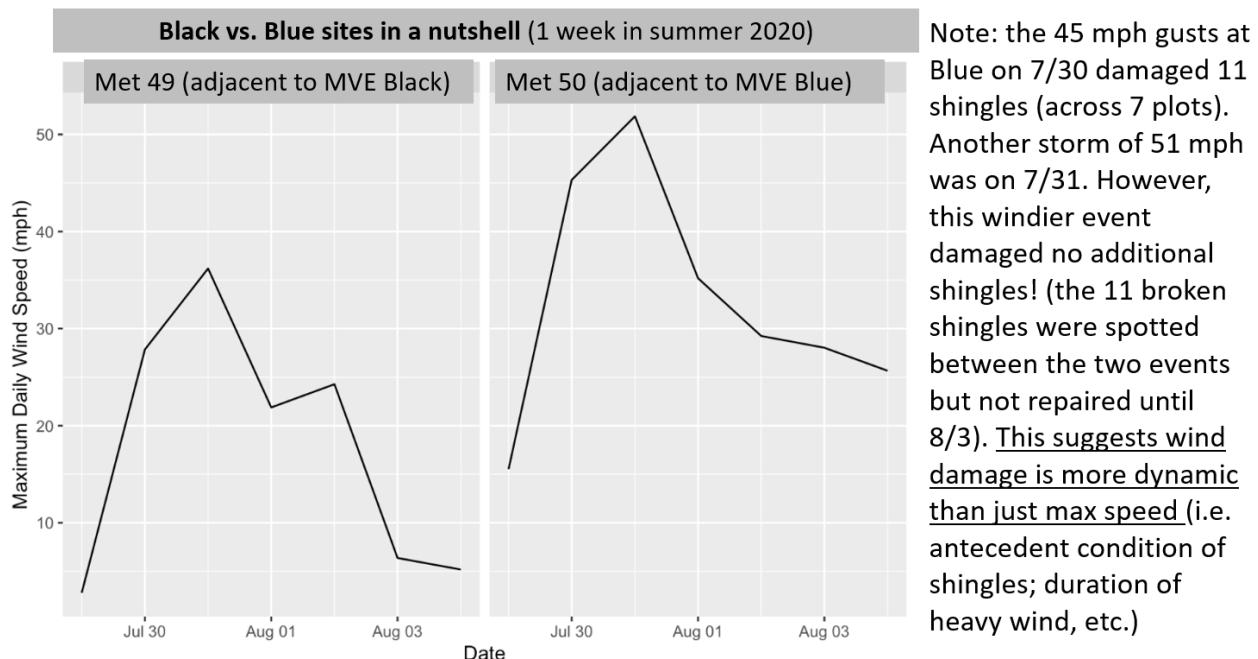


## Lessons learned/time will tell

Wind abatement will be an ongoing point of concern for MVE maintenance and Sev infrastructure at large. We have gained more knowledge about what can be done to improve the situation and things we can expect going forward. First, there are some bullet points of the main takeaways from this section and some points about moving forward in the effort against wind. Finally, the last figure of this section is some examples about future strategies that may work or inspire other improvements.

- Any wind over 45 mph can damage infrastructure and unfortunately this wind is common; improvements are therefore needed
- Regular maintenance is expected throughout the year (ex: re-tying fallen gutters w/ thicker wires; replacing broken shingles; constant assessment of storms)
- We know Blue site is more vulnerable than Black/Creosote sites. Not only because of the data (see fig below) but because of damage that occurs regularly at MVE and EDGE Blue sites but not at MVE and EDGE Black sites.



- More strategies will be employed in the future if damage continues
  - See pic below
  - More installation of 'stabilizer lines' (see above)
  - JB Henderson suggestions: see a pasted email from J. Rutgers on her conversations with JBH

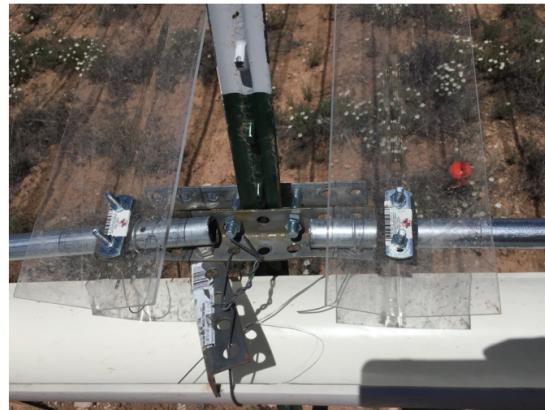
## Examples of potential future solutions for wind abatement

### Pin attachment of conduit to bracket



As a strategy to make removing panels easier during treatment swaps, all paired plots at MVE Black are held to the brackets with pins on the outer posts. This may prove an effective method for combating wind since the conduit is actually bound to the bracket (which in turn is bound to the post) instead of suspended via carriage bolts. Note: guy wires still pulling posts inward to a) combat shaking and b) reduce pin stress

**Wire tying conduit:** some T-posts were installed incorrectly by 90 degrees forcing brackets to sit off as well. However, simply tying down the panels to the brackets with thick wire may prove to be a quick and reliable binding option (this is similar to EDGE shelter installation which is reliable)



### An excerpt from an email conversation from J. Rudgers about talks with JB-H 5/20/20:

JB Henderson's suggestions for wind resistance at MVE blue

1. Add a PVC brace for "V" up shingles this would go across the middle of the side of the shelter (half way up a shingle) then wire each shingle to the PVC to stop them from twisting side to side in the wind. For "^" down shingles, the PVC would instead go underneath the conduit on the low end of the shelter to provide additional support for the downward attachment of the shingles hanging off the conduit (counteract gravity and the weight of the shingle pulling on the bolt). For this, we may only need to wire the PVC to the conduit at each end, rather than wiring each shingle to it. I suggest we try this on plot 7 MVE blue and one control plot that has had repeatedly broken shingles to see if that helps it.
2. When we swap treatments (this July at Blue), consider lowering the roof closer to the ground on all t-posts – we would have to shorten or remove the spacers (black vertical pipes) that are used with the sprinkler heads
3. Try shingles made from Lexan (will be more expensive, but they will get a quote for us); this is more rubbery and less likely to crack at the bolt hole.
4. For any shingles that get replaced... pre-drill the hole only on one end, then drill the second hole in the field, which will create less pressure/tension on the shingle in spots where the conduits are not exactly parallel or at the right distance from one another.

More desperate measures:

-JB Henderson is willing to pour concrete for us to stabilize t-posts more, but suggested they would try tension wires on the sides that don't have them first – this could cause more breakage since some shingles are already under pressure between the perpendicular conduit

Solutions for next install:

- JB Henderson will get us a quote for them to machine a brace for the shingles that would sit on top of the conduit. Sort of like... WWWW... the shingles won't be able to shake side to side if we have something like this in place.

- Consider only drilling one hole for all of the shingles in the future.

## **ARMS vs. MVE**

The MVE shelter and irrigation system emulates the original ARMS design but diverges in a few key ways. For this reason, it may be important to justify omissions and additions that deviate from ARMS (Gherardi et al. 2013). This will improve our methods by solving design follies and anticipating issues during the review process.

ARMS used flow meters to record water on the outlet side of the pump, ensuring that the system was working properly and achieving desired treatments based on precipitation events. This allowed them to model expected (rain measurements) vs. observed (pumped) precip. We do not have flow meters. T

## Ordering material + costs

Posted here is info about buying material (what where why?). Some receipts are also pictured to help with pricing, ordering, vendor contact info, part #'s, etc. etc. Work with UNM Bio Accounting department to order things. Personal note: I have had more success ordering most items directly from vendors when possible as opposed to Amazon. Not listed below are various items that can be purchased on an as-needed basis from Home Depot or other hardware stores (i.e. insulation, electrical tape, wire tie, etc.)

### Shingles

Port Plastics in Albuquerque sells Acrylic sheets (1/8" x 96" x 48") for \$74 per sheet which produces 9 shingles.

- 25% shelters: (6 shingles \* 4 panels \* 5 plots) = 120 shingles
- mock shelters: (9 shingles \* 4 panels \* 10 plots) = 360 shingles
- 50% shelters: (11 shingles \* 4 panels \* 10 plots) = 440 shingles
- 75% shelters: (17 shingles \* 4 panels \* 5 plots) = 340 shingles
- A full MVE site thus needs 1260 shingles
- Assuming damage in the field and during fabrication, extras are needed (an additional 144 is standard): **a site needs 1404 shingles**
- 1404/9 shingles in a sheet of acrylic = 156 sheets \* \$74.00 = **\$11,544.00 in materials**

Shingles arrive with manufacturer's paper which takes approx. 30 seconds to tear off. Bending requires two people and averages 2 minutes per shingle. Drilling averages 30 seconds per shingle. Hence a conservative time estimate for shingle fabrication of a site is:

- (3 minutes \* 1404) / 60 minutes = 71 hours labor time
- ((2 minutes \* 1404 \* 2 people) + (1 minute \* 1404)) / 60 minutes = 117 people hours
- 117 people hours @ undergraduate labor rate \$10.50/hr = **\$1,228.50 in labor**

MVC (Oct 2020) order:



QUOTE  
THIS IS NOT AN INVOICE

Page 1 of 1  
Quote Number: 1740243 SQ  
Quote Date: 10/1/20  
Customer No: 94867  
Branch Plant: 840

2109 CANDELARIA ROAD NE  
ALBUQUERQUE NM 87107  
Phone (505) 8840507 Fax (505) 8840525

Sold To: 94867
UNIVERSITY OF NEW MEXICO
GNATE HALL 222
ALBUQUERQUE NM 87131

Ship To: 94867
UNIVERSITY OF NEW MEXICO
BIOLOGY DEPARTMENT
ALBUQUERQUE NM 87131

Customer PO	Customer Phone	Planned Carrier	Planned Freight Terms			
ANTHONY LUKETICH	505 2777169	WILL CALL CARRIER	WILL CALL			
Payment Terms						
CREDIT CARD		Salesperson	ADRIAN MARTINEZ			
Qty Req	UoM Description Cust Item Number	Item Number/ Lot	Units Req	PR UoM	Unit Price	Total
156.000	SH ACR EXTR CLEAR FM .118 X 48 X 96 ▲ETHYL ACRYLATE  cut to 1,404 each 5" x 96" strips Lead Time 1 - 2 days	18253	156.000	SH	74.000	11,544.00

## Guy-wires, Turnbuckles, and Clamps

This is the material for securing the guy wires on the shelters (3/16" cable – see MVG site to understand material). Fastenal in Abq has great prices compared to online vendors. The quote below was for MVG and enough material was ordered for the "X" installation and the "rubber bands" installation (see Wind Damage section). As of Oct 2020, not all MVG shelters have yet received rubber bands, hence there is some leftover; although they should be installed just to be safe.

Material is picked up from the store and delivered to the site; guy wires should be installed ASAP after a shelter is constructed.



*Price Quotation  
CONFIDENTIAL*

March 6, 2020

UNIVERSITY OF NEW MEXICO  
1818 CAMINO DEL SERVICIO NE  
ALBUQUERQUE, NM 87131-0001  
ATTN: Francis

Phone: 505-277-1327  
Fax:  
Contract No: 2018.000208

Account #: AQNM0661  
Quote #: 115763  
Job #:

Due Date: 03/9/2020  
Expiration Date: 04/6/2020  
PO #:

Part #	Customer Part #	Description	Quantity	Price/C	Extended Price
45525		S/S Cbl 3/16 (7X19)	2,500	\$86.0000	\$2,150.00
43030		TB EYE-EYE 3/8 X 6	88	\$1,133.0000	\$997.04
43402		MALL CC 3/16	1,100	\$104.0000	\$1,144.00

USD Subtotal: \$4,291.04  
Shipping & Handling: \$0.00

## Pumps

Pumps are ordered from Seaflo, see attached quote for contact info. The quote below is from MVG order and was delivered to UNM Bio. 11 pumps were ordered to have a backup ready to go.

Seaflo Marine & RV North America  
808 North Central Ave  
Wood Dale, IL 60191  
844-473-2356  
sales@SeafloUSA.com



## INVOICE

BILL TO	SHIP TO	INVOICE #
Anthony Luketich University of New Mexico 1 University of New Mexico MSCO3 2020 Castetter Hall Albuquerque, NM 87131	Anthony Luketich University of New Mexico 1 University of New Mexico MSCO3 2020 Castetter Hall Albuquerque, NM 87131	4053
		DATE 02/07/2020
		DUE DATE 02/07/2020
		TERMS Due on receipt

SKU	DESCRIPTION	QTY	PRICE	AMOUNT
SFDP1- 030- 055-42		11	47.99	527.89
<hr/>				
Country of Origin: China	SUBTOTAL			527.89
	SHIPPING			38.86
	TOTAL			566.75
	BALANCE DUE			\$566.75

## Pump batteries

After power-budgeting for combined winter heat-tape operation and intense rain events, the irrigation systems received solar panel (see next section) and battery upgrades. The batteries are picked up from Interstate batteries (aka More-Co batteries) in Abq; see quote. Note: the '24DC boxes' portion of the quote are the battery boxes, but these should not be purchased again, as future installs should probably contain a larger box (Husky storage container or Action Packer) for both battery + solar charge controller (see irrigation electrical section).

INTERSTATE BATTERIES						
1910 1ST STREET NW ALBUQUERQUE NM 87102 T:(505)247-3434 F:(505)247-9199			DATE February 3, 2020			
TO	UNM					
SALESPERSON	JOB	SHIPPING METHOD	SHIPPING TERMS	DELIVERY DATE	PAYMENT TERMS	DUUE DATE
BARRY					Due on receipt	
QTY	ITEM #	DESCRIPTION		UNIT PRICE	DISCOUNT	LINE TOTAL
18.00	24DC-1	95AH MORCO DEEP CYCLE		\$ 89.95		\$ 1,619.10
20.00	24 BOX	24DC BOXES		10.95		219.00

## Pump solar panels and charge controllers

For operating the pumps and keeping the batteries charged we bought SunSaver brand solar controllers and SolarLand brand solar panels. We bought these through Solarflexion.com and they were delivered to us (quote below). If better products or prices are found for panels, sticking with SolarLand is not imperative, however I urge sticking with the same charge controller (assuming we keep the same pump model).

38365 Innovation Ct., Suite 1005  
Murrieta, CA 92563  
(800)942-2424  
[www.solarflexion.com](http://www.solarflexion.com)

**INVOICE**  
**Date:**      **Order#:**  
03/10/2020 **31396**

**Bill To:** (Customer ID#1034)

**Ship To:**

University of New Mexico	University of New Mexico
Anthony Lukechith	Anthony Lukechith
TBD	TBD
Albuquerque, NM 87131	Albuquerque, NM 87131
United States	United States
520-820-9971	520-820-9971
lukechith.anthony@gmail.com	

**Payment Method:**

**Shipping Method:**

**NONE**

Custom Shipping Quote Required

<b>Code</b>	<b>Description</b>	<b>Qty</b>	<b>Price</b>	<b>Total</b>
SLP100-12U	<b>SLP100-12U</b>	<b>20</b>	\$187.46	\$3,749.20
SS-10L-12V	<b>Morningstar SunSaver SS-10L-12V w/ Low Voltage Disconnect (LVD) &gt; 10 Amp (12V) Charge Controller</b>	<b>10</b>	\$76.00	\$760.00
Shipping	<b>Shipping Services</b>	1	\$267.77	\$267.77

Subtotal: \$4,776.97

Tax: \$0.00

Shipping & Handling: \$0.00

**Grand Total: \$4,776.97**

## Sensor cables and splice connectors

We order our sensor cables and other products at Graybar in Abq and just pick them up from their store. Below is the quote for MVC, for the various cables and splicers that connects the sensors, muxes, dataloggers etc.



works to your advantage

281 MENAUL BLVD NE  
ALBUQUERQUE NM 87107-1523  
Phone: 505-449-4500  
Fax: 505-449-4533

To:	UNM - COMM DATA PURCHASING UNM BUSINESS CENTER, SUITE 2600 1 UNIVERSITY OF NEW MEXICO ALBUQUERQUE NM 87131-0001	Date:	08/20/2020
Attn:	Anthony Luketick	Project Name:	
Phone:	505-277-2036	GB Quote #:	0236061159
Email:		Purchase Order Nbr:	
Fax:	505-277-7774	Release Nbr:	
		Additional Ref#:	
		Revision Nbr:	
		Valid From:	08/20/2020
		Valid To:	09/19/2020
		Contact:	BARBARA BARRETT
		Email:	barbara.barrett@graybar.com

### Proposal

We appreciate your request and take pleasure in responding as follows

#### Notes:

Item	ItemType	Quantity	Supplier	Catalog Nbr	Description	Price	Unit	Ext.Price
100		1000	BELDEN	2C18-FPL-R-M -B-BED	5320UJ 002U1000	\$164.59	1000	\$164.59
<b>GB Part#:99913205 UNSPCS:26121600 MFR SPEC SHEET</b>								
<b>Ship From:</b> Stock DENVER, SERVICE CENTER <b>Long Description:</b> Red Riser electronic wire has (2) 18 AWG conductors. Wire is packaged in 1000 ft. Reel. Belden alt. mfr. number: 5320UJ 002U1000								
101		1000	SOUTHWIRE	F40015-1A	18/2 TWISTED SHIELDED PAIR FPLR	\$93.12	1000	\$93.12
101		1000	SOUTHWIRE	F40015-1A	18/2 TWISTED SHIELDED PAIR FPLR	\$93.12	1000	\$93.12
<b>GB Part#:25795156 UNSPCS:26121604 Ship From:</b> Stock-MULT. Shipments Scheduled								
Graybar would like to offer this item as an alternate for item ( 000100 ). The price for this suggested item is not factored into the total for this quote.								
200		1000	GENERAL CABLE	6C24FS-CMR-G Y-R-A-GCC	C0743A.41.10	\$283.03	1000	\$283.03
<b>GB Part#:25043712 UNSPCS:26121600 Ship From:</b> Stock ZONE-FRESNO, CA <b>Long Description:</b> Carol&#174; Computer Cable, No. of Conductors: 6, Conductor Size: 24 AWG, Tinned Copper, PVC								
300		1000	GENERAL CABLE	3C24FS-CMR-G Y-R-A-GCC	C0741A.41.10	\$169.83	1000	\$169.83
<b>GB Part#:25164027 UNSPCS:26121600 Ship From:</b> Will Call ALBUQUERQUE, NM <b>Long Description:</b> Carol&#174; Computer Cable, No. of Conductors: 3, Conductor Size: 24 AWG, Tinned Copper, PVC								
400		200	BELDEN	709SC	TELECOM WIRE CONNECTOR FILLED	\$46.78	100	\$93.56
<b>GB Part#:22086991 UNSPCS:39121400 Ship From:</b> Stock DENVER, SERVICE CENTER <b>Long Description:</b> Pink, pair-at-a-time filled inline connector for solid 2-conductors, 26 to 22 AWG.								

Total in USD (Tax not included): \$711.01

### **Sensors (soil moisture and temperature)**

Meter Group makes the Teros 11 sensors which is the current model used at MVG, MVC.

## Dataloggers and enclosures

We are using CR1000 starting with Jsav

Campbell Scientific makes the dataloggers, multiplexers, and weather-proof enclosures we use to collect soil moisture and other data. Below is the quote for the products ordered for MVC.

						Price	Quote Date:	20 Aug 2020
							Valid Through:	19 Oct 2020
							Quoted By:	<input checked="" type="checkbox"/> Brittany Batt
							Credit Terms:	<a href="#">Apply now</a>
							Freight Terms:	PP&A
							Incoterms:	FOB Logan, UT
1		<a href="#">CR6-NA-ST-SW-CC</a>	Measurement & Control Datalogger -NA No Additional Coms -ST -40 to +70C -SW Standard 3yr Warranty -CC Campbell Calibration	1	\$1,915.20	\$1,915.20	To	
2		<a href="#">AM16/32B-ST-SW</a>	16 or 32 Channel Relay Multiplexer -ST -25 to +50C -SW Standard 1yr Warranty	3	\$576.00	\$1,728.00	Anthony Luketich University Of New Mexico Biology Dept MSC03 2020 Albuquerque, New Mexico 87131 United States	
3		<a href="#">ENC12/14-SC-MM</a>	Weather-Resistant Enclosure, 12 x 14 inches -SC 1 Conduit for Cables -MM Tripod Mast Mounting	2	\$321.60	\$643.20	Ship To	
4		<a href="#">ENC16/18-SC-SB-MM</a>	Weather-Resistant Enclosure, 16 x 18 inches -SC 1 Conduit for Cables -SB Standard Backplate -MM Tripod Mast Mounting	1	\$465.60	\$465.60	University Of New Mexico 1 University of New Mexico MSC03 2020 Ceria 315 Albuquerque, New Mexico 87131 United States	
						Sub Total: \$4,752.00 Tax: \$0.00 Freight: \$55.88 <b>Grand Total: \$4,807.88</b>		

## Shelter hardware

### ABQ bolt and fastener is also good

Ordering hardware from True Value in Abq was far superior than ordering it from Amazon, as in-person communication with managers when placing the order (recommended) was good, and the order arrived all at once in a convenient package. Amazon orders arrive in broken boxes at different times and the vendors are mysterious cyborg creatures shrouded in conspiracy (probably). Also I have a anti-online ordering bias that stems from fear of my own laziness, fear of human workers becoming obsolete, and fear of Jeff Bezos. The receipt below is probably not everything at a site, but one should take an inventory of what is needed at a site and then take that to True Value. Some notes: 1) a lot of extra hardware exists at the FS storage e.g. lots of carriage bolts, hex bolts, etc. 2) make sure nuts and bolts truly work together (3/8" zinc nuts may not screw on easily or at all to a 3/8" galvanized bolt).



## Float switches

The float switches were an item I did not mind ordering from Amazon.



Roll over image to zoom in

### attwood Atwood 4202-7 Automatic Float Switch, One size

Brand: attwood

★★★★★ 115 ratings | 4 answered questions  
Amazon's Choice for "attwood float switch"

List Price: \$32.25

Price: **\$25.13** & FREE Returns

You Save: \$7.12 (22%)

Get \$60 off instantly: Pay \$0.00 upon approval for the Amazon.com Store Card.

Available at a lower price from other sellers that may not offer free Prime shipping.

- Converts manual bilge pump into one that is controlled fully automatically
- Compact, low-profile design that mounts on any surface from horizontal up to a 24-degree angle
- Reliable mechanical switch that actuates pump motor at 2 inches water level
- 12- and 24-volt CE rated with a 36-inch wire connection
- Maximum amp draw is 12 amps (at 12-volt DC) or 6 amps (at 24-volt DC)
- Measures 4 1/4 inches L x 3 7/8 inches W x 1 3/8 inches H

**\$25.13**

& FREE Returns ▾

FREE delivery: Thursday, Oct 29  
[Details](#)

Fastest delivery: Tomorrow  
Order within 11 hrs and 44 mins [Details](#)

In Stock.

Qty: 1 ▾

Add to Cart

Buy Now

Secure transaction

Ships from Amazon.com  
Sold by Amazon.com

Return policy: [Returnable until Jan 31, 2021](#) ▾

Yes, I want **FREE delivery, as fast as today** with [Prime](#)

## **Conduit**

EMT conduit (3/4") comes in 10 ft lengths and has been ordered from a few different vendors. Each shelter needs 8 conduit (cut down to their 8' 2" length). Therefore, (8\*30 =) 240 sticks of conduit are ordered per site. Avg cost has been ~6/7 dollars per stick)

### **T-posts**

Important: Creosote bushes are tall. If the shelters at MVC need to be built taller than grassland sites, taller T-posts will be needed (and on that note beware of additional wind susceptibility).

Each shelter needs three 8' T-posts for the center of the plot and six 5.5' T-posts for the outsides. So a site needs: 90 8-foot posts and 180 5.5-foot posts. Raks and Tractor Supplies are both stores that have these in stock. Hint: picking up posts from Tractor Supplies at the Bosque Farms location and then driving them straight to the site is pretty quick.

## Pump Boxes

The pump boxes are similar to the weather proof enclosures from Campbell Sci but a little cheaper (in both price and quality but they seem to do the job thus far). For MVG, we ordered from Master Electronics (see below). The boxes are Bud Industries NBB-15245. The NBX part is the back plate that fits inside the box which is good for a few reasons such as weighing down the box, and elevating the pump to help sheet away potential leaks.



(952) 960-4774

Manufacturer	Part Number	Quantity	Availability	Price	Ext.Price
Bud Industries	NBB-15245	10	10 Ships 03/09/2020	\$66.18	\$661.80
Bud Industries	NBX-10986	10	1 Ships 03/09/2020 9 Due: 05/01/2020	\$10.62	\$106.20
					<b>Subtotal:</b> \$768.00
					<b>Shipping:</b> \$17.98
					<b>Order Total:</b> \$785.98

## Rain barrels

Rain barrels are made and sold in Abq from Desert Plastics, the line of product is called Tijeras rain barrels, and the model is the Agua Fria. See order forms and quotes below.

Promised Date	AF 10679 Invoice # _____
Fax to Desert Plastics @ (505) 884-3932	
<b>"AF Companion" ONLY Build Sheet</b>	
Order Date:	3/6/2019
Quantity:	10
Distributor:	UNM Biology Department
Job Name:	Anthony L.
Salesman:	Vanessa
PO #	277-2N2
Barrel Size:	<input checked="" type="checkbox"/> 55 Gallon Vertical <input type="checkbox"/> 100 Gallon Vertical <input type="checkbox"/> 200 Gallon Vertical <input type="checkbox"/> 360 Gallon Vertical
Standard Top:	The removable tops are solid with a 4" dia. Ring & Cap inlet and secured with mechanical fasteners like the regular Agua Fria series. <input checked="" type="checkbox"/> COVER VENT-HOLE HOLES WITH PLATES
Colors:	<input type="checkbox"/> Blueberry <input type="checkbox"/> Bright Yellow <input type="checkbox"/> Bright Red <input type="checkbox"/> Dark Grey <input type="checkbox"/> Bright Blue <input type="checkbox"/> Light Adobe <input type="checkbox"/> Latte <input type="checkbox"/> Wickertone <input type="checkbox"/> Bright Green <input type="checkbox"/> Medium Adobe <input checked="" type="checkbox"/> Black <input type="checkbox"/> Natural <input type="checkbox"/> Sandstone <input type="checkbox"/> Sherwood Green <input type="checkbox"/> Dark Adobe <input type="checkbox"/> White <input type="checkbox"/> Turquoise
<input checked="" type="checkbox"/> SOLID COLOR <input type="checkbox"/> SPECKLED COLOR	

Plus Version: Includes Internal Overflow, Backup Overflow, and Drain Fitting plus valve.

Tell us where to install your fittings.

0°: A(3/4") 2NPT      45°: \_\_\_\_\_  
 90°: \_\_\_\_\_      135°: A(1/2") 2NPT  
 180°: \_\_\_\_\_      225°: A(1/2") 2NPT  
 270°: \_\_\_\_\_      315°: \_\_\_\_\_

Factory DEFAULT locations are OK. These positions are "A" @ 0° / 360°, "B" @ 90° and "D" @ 270°.  
 I want CUSTOM locations at no extra charge! Please indicate below by placing the appropriate letter in the desired position. Notice "C" is optional at additional charge.

A. Fitting for Drain Valve  
 3/4" NPT Fitting; Single Threaded; Natural Color; installed as close to bottom as possible.

B: Fitting for Primary Overflow  
 1-1/2" NPT Fitting; Double Threaded; Natural Color; installed as close to bottom as possible.  
 \*AF 360 Remote Tank has a 2" NPT Fitting.

C: Fitting for Bucket-high Throttling Valve  
 3/4" NPT Fitting; Single Threaded; Natural Color; installed approx. 16" from bottom

D: Fitting for Backup Overflow / Manifold  
 1-1/2" NPT Fitting; Double Threaded; Natural Color; installed approx. 3" underneath lip.  
 \*AF 360 Remote Tank has a 2" NPT Fitting.

### **Gutters and irrigation parts**

MVE gutters are weird: From Williams Windmill in Lemitar, we order 4" x 20' pipes of schedule 40 PVC. At their shop, they cut the pipes length-wise down the entire stretch; this creates 2 "half-pipes" per pipe and each half-pipe becomes a gutter on one end of the shelters. They charge for cutting labor as well as delivery to the site. Because 20 plots get gutters, we order 20 pipes (aka 400 ft) and therefore 40 half-pipes.

# Desert Plastics

2401 A Phoenix, NE  
Albuquerque, New Mexico 87107



## Quotation

Date

3/6/2019

## Quotation #

10679

FOR

## Albuquerque

Name / Address

University of New Mexico  
Accounts Payable  
PO Box 4548  
Albuquerque NM 87196



# Williams Windmill Inc.

P.O. Box 7 Lemitar, New Mexico 87823  
Telephone (575) 835-1630 Fax (575) 838-4536  
[Williamwindmill@live.com](mailto:Williamwindmill@live.com)

No: 143889

4-16-19

★ UNM Biology

QUANTITY	DESCRIPTION	PRICE	AMOUNT
300'	4" Sch 40	230	460.00
5	Haw. Shop Labor	300	1500.00
	Delivery Fee	250	250.00
			1010.00
		TTIC	

As for the rest of the irrigation fittings, the easiest thing to do would be to go to MVG and write down everything you need (from the gutter fittings to the barrel to the pumps to the sprinklers etc....) After that get a quote from 2 irrigation stores in town for the material. (Quote examples below). You may have to mix and match as Sisco has some parts that WinSupply may not, but Sisco 4" elbows are insanely overpriced.



3101 VASSAR DR NE  
ALBUQUERQUE, NM 87107-1839  
PHONE (505) 883-8500  
FAX (505) 883-8505

**Quoted To Customer**

UNM GROUNDS & LANDSCAPING  
ENVIRONMENTAL SERVICES, A.V.  
1200 UNIVERSITY N.M.  
ALBUQUERQUE, NM 87131-0000

Phone (505) 277-0615  
Fax (505) 277-1250

**Quoted By**

Job Name  
biology dept/anthony luketich

Quote No.	Date	Page
0002701	1/29/20	1
Expiration Date		2/28/20
Revised Date		1/29/20
Bid Due Date		1/29/20

Derek  
dsbutt@winsupplyinc.com  
(505) 883-8500

Customer	Payment Terms	Quoted To		Salesperson	POB
001623	COD-CASH/CREDIT CARD	UNM GROUNDS & LANDSCAPING		LOREN DUNLAP	D
Line	Qty.	Description	Unit Price	GOM	Extended Price
1.0	20	430-0005 1/2 SCH40 FKF CPLG 1/2" COUPLING (FT) SCH40 0605430005 Spec sheet: <a href="http://www.winsupply.com/specs/120130005_430-0005_0605430005_SPEC.pdf">http://www.winsupply.com/specs/120130005_430-0005_0605430005_SPEC.pdf</a>	.3160	EA	6.32
2.0	20	430-12-12 1/2X6 PVC80 NIPPLE 1/2" X 6" NIPPLE SCH80 PVC 2330PM12 Spec sheet: <a href="http://www.winsupply.com/specs/12013012-12_430-12-12_0605430012_SPEC.pdf">http://www.winsupply.com/specs/12013012-12_430-12-12_0605430012_SPEC.pdf</a>	.3800	EA	7.60
3.0	20	430-12-12 1/2X12 PVC80 NIPPLE 1/2" X 12" NIPPLE SCH80 PVC 2330PM12 Spec sheet: <a href="http://www.winsupply.com/specs/12013012-12_430-12-12_0605430012_SPEC.pdf">http://www.winsupply.com/specs/12013012-12_430-12-12_0605430012_SPEC.pdf</a>	.6268	EA	12.54
4.0	20	430-12-12 1/2X12 PVC80 NIPPLE 1/2" X 12" NIPPLE SCH80 PVC 2330PM12 Spec sheet: <a href="http://www.winsupply.com/specs/12013012-12_430-12-12_0605430012_SPEC.pdf">http://www.winsupply.com/specs/12013012-12_430-12-12_0605430012_SPEC.pdf</a>	2.4500	EA	49.00
5.0	50	413-007 3/4" PVC INSXMT 90 3/4" ELL (PM) POLY INSERT 0605140007 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_413-007_0605140007_SPEC.pdf">http://www.winsupply.com/specs/12013007_413-007_0605140007_SPEC.pdf</a>	1.2600	EA	63.00
6.0	30	430-007 3/4 PVC INS X MIP 3/4" MALE ADAPTER (PM) POLY 0605140007 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_430-007_0605140007_SPEC.pdf">http://www.winsupply.com/specs/12013007_430-007_0605140007_SPEC.pdf</a>	.4640	EA	13.92
7.0	20	R814V 8-14 ROTATOR NOZZLE 8-14 VARIABLE ROTATOR NOZZLE 1920A84663 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_814V_1920A84663_SPEC.pdf">http://www.winsupply.com/specs/12013007_814V_1920A84663_SPEC.pdf</a>	5.9471	EA	118.94
8.0	10	R-VAN17 24" ADJ ROTARY NOZZLE 17-24 VARIABLE ROTATOR NOZZLE 1920A84663 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_R-VAN17_1920A84663_SPEC.pdf">http://www.winsupply.com/specs/12013007_R-VAN17_1920A84663_SPEC.pdf</a>	5.9375	EA	59.38
9.0	20	1407-101 3/4X1/2 INS RED 90 3/4" X 1/2" ELL (PT) FITT P 06051407101 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_1407-101_06051407101_SPEC.pdf">http://www.winsupply.com/specs/12013007_1407-101_06051407101_SPEC.pdf</a>	.7636	EA	15.27
10.0	10	1407-101 3/4X1/2 INS RED 90 3/4" X 1/2" ELL (PT) FITT P 06051407101 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_1407-101_06051407101_SPEC.pdf">http://www.winsupply.com/specs/12013007_1407-101_06051407101_SPEC.pdf</a>	.7636	EA	7.64

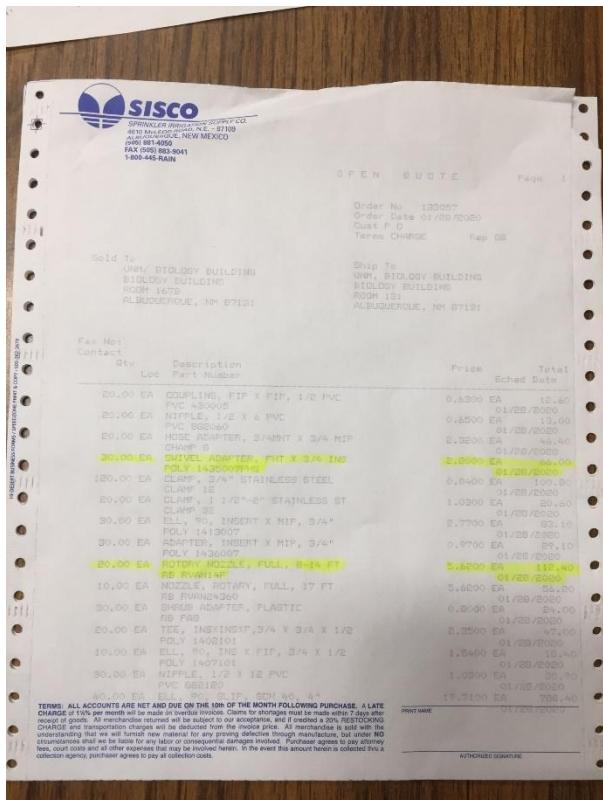


Job Name  
biology dept/anthony luketich

Quote No.	Date	Page
0002701	1/29/20	2
Expiration Date		2/28/20
Revised Date		1/29/20
Bid Due Date		1/29/20

Line	Qty.	Description	Unit Price	UOM	Extended Price
11.0	30	Spec sheet: <a href="http://www.winsupply.com/specs/12013007_HRN100-000-PM_HRN100_SHRUB_ADAPTER_117994525_SPEC.pdf">http://www.winsupply.com/specs/12013007_HRN100-000-PM_HRN100_SHRUB_ADAPTER_117994525_SPEC.pdf</a>	1.0227	EA	30.68
12.0	40	437-040 4 SCH40 90 ELL 4" X 1/2" ELL SCH40 0605406040 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_437-040_0605406040_SPEC.pdf">http://www.winsupply.com/specs/12013007_437-040_0605406040_SPEC.pdf</a>	6.6857	EA	267.43
13.0	40	437-420 4XZ SPGXS PVC40 BUSH 4" X 2" BUSHING (SS) SCH40 0605437420 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_437-420_0605437420_SPEC.pdf">http://www.winsupply.com/specs/12013007_437-420_0605437420_SPEC.pdf</a>	4.2714	EA	170.86
14.0	40	438-248 2X3/4 S40 SPGXP BUSH 2" X 3/4" BUSHING (ST) SCH4 0605438248 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_438-248_0605438248_SPEC.pdf">http://www.winsupply.com/specs/12013007_438-248_0605438248_SPEC.pdf</a>	1.2666	EA	50.66
15.0	150	SSCB710 9/16-1 1/16 S.S CLAMP 3/4" HOSE CLAMP 51805SCB710 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_SSCB710_51805SCB710_SPEC.pdf">http://www.winsupply.com/specs/12013007_SSCB710_51805SCB710_SPEC.pdf</a>	.5428	EA	81.42
16.0	2	A 3/4" X 10' PE TUBING 3/4" POLY TUBING 500' ROLL 0657A940 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_A_34_X_10PE_TUBING_0657A940_SPEC.pdf">http://www.winsupply.com/specs/12013007_A_34_X_10PE_TUBING_0657A940_SPEC.pdf</a>	66.3846	RL	132.77
17.0	10	TT520 1/2X520 TFEFLON TAPE 1/2" X 520' TFEFLON TAPE 51807T520 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_TT520_51807T520_SPEC.pdf">http://www.winsupply.com/specs/12013007_TT520_51807T520_SPEC.pdf</a>	.4666	EA	4.67
18.0	1	PVC25B-032 1QT PVC 25 MED BDY 1/2" X 1/2" X 32" DRY PVC CEMENT 0605PVC25B0320A Spec sheet: <a href="http://www.winsupply.com/specs/12013007_PVC25B-032_0605PVC25B0320A_SPEC.pdf">http://www.winsupply.com/specs/12013007_PVC25B-032_0605PVC25B0320A_SPEC.pdf</a>	19.2333	EA	19.23
19.0	1	FPRIM68P-020 1FT PRIMER-68 PRP F68 PINT PURPLE PRIMER 0605PRIM68P020 Spec sheet: <a href="http://www.winsupply.com/specs/12013007_FPRIM68P-020_0605PRIM68P020_SPEC.pdf">http://www.winsupply.com/specs/12013007_FPRIM68P-020_0605PRIM68P020_SPEC.pdf</a>	9.6000	EA	9.60

Tax Area Id	Net Sales	1,120.95
320010020	Freight	.00
	Tax	.00
	Quotation Total	1,120.95



**SISCO**  
SPRINKLER IRRIGATION SUPPLY CO.  
4810 MULLEDO ROAD, N.E. - 87109  
ALBUQUERQUE, NEW MEXICO  
(505) 881-4062  
FAX (505) 883-4041  
1-800-449-7444

OPEN QUOTE Page 2

Order No. 1330527 Order Date 01/28/2000 Cust P.O. Term CHARGE Rep 00

Billed To: UNM/BIOLOGY BUILDING BIOLOGY BUILDING ROOM 1475 ALBUQUERQUE, NM 87131

Ship To: UNM/BIOLOGY BUILDING BIOLOGY BUILDING ROOM 121 ALBUQUERQUE, NM 87131

Fax No:	Qty	Description	Price	Total
Contact:	Loc.	Part Number		Sched Date
	40.00 EA	BUSHING, SLIP X SLIP 4" X 2"	11.9800 EA	479.40
	20.00 EA	PVC 437420 BUSHING, SLIP X FIP, 2" X 3/4"	0.8100 EA	16.20
	25.00 EA	PVC 438240 PIPE, POLYETHYLENE, 3/4" INSERT X SP100T, 2"	4.4700 EA	111.75
	600.00 FT	PIPE, POLYETHYLENE, 3/4" NSF POLY 075PIPE	0.2700 FT	174.00
				01/28/2000
				01/28/2000
				01/28/2000
Shipped Via: MC	Accept Back Order: Y	Subtotal: \$225.30		
FOB:				
			Sales Tax: 0.00	
			Shipping: 0.00	
			Total: \$225.30	

TERMS: ALL ACCOUNTS ARE NET AND DUE ON THE 10th OF THE MONTH FOLLOWING PURCHASE. A LATE CHARGE of 1% per month will be made on delinquent accounts for products not paid for within 30 days of purchase. A minimum charge of \$10.00 will be made on all accounts, and a credit of 25% RESTOCKING CHARGE and transportation charges will be deducted from the invoice price. All merchandise is sold with NO WARRANTIES. SISCO IRIGATION SUPPLY CO. WILL NOT BE HELD LIABLE FOR ANY DAMAGE OR LOSS. NO circumstances shall we be liable for any labor or consequential damages involved. Purchaser agrees to pay attorney fees and court costs in the event of collection by a collection agency. In the event this amount herein is collected by a collection agency, purchaser agrees to pay all collection costs.

PRINT NAME \_\_\_\_\_

AUTHORIZED SIGNATURE \_\_\_\_\_

## Angle iron

12 gauge ‘punched’ angle iron is what we cut into smaller pieces to make the brackets which hold the shelters up on the T-posts. Hint: there are a different configuration of “hole-cuts” depending on the type of shelter (i.e. mock plot versus capture plot) and what you need determines how many different types need to be cut from the larger stick of angle iron. This can be ordered at Fastenal along with guy-wire to consolidate orders. The amount is ordered in 28 sticks which are all 10' long. Pick up and take to field station.



Cust. No. AQNM0661  
 Cust. P.O. Biology  
 Job No.

**Sold To**  
 UNIVERSITY OF NEW MEXICO  
 1818 CAMINO DEL SERVICO NE  
 ALBUQUERQUE, NM 87131-0001  
 505-277-1105; 505-277-3561(Fax)

Fastenal Company  
 P.O Box 1286  
 WINONA, MN 55987-1286

The store serving you is  
 3204 Candelaria Ave.

ALBUQUERQUE, NM 87107  
 Phone #: (505)880-1124  
 Fax #: (505)880-1139

### Invoice

Date	Reference No	Page
6/3/19	NMALB241290	1
DUE DATE: 07/03/2019		

**Ship To**  
 Contract No:  
 2018.000208  
 Picked up at Fastenal Store

*This Order and Document are subject to the "Terms of Purchase" posted on [www.fastenal.com](http://www.fastenal.com).*

Line No.	Quantity Ordered	Quantity Shipped	Quantity Backorder	Description	Control No.	Part No.	Price / Hundred	Amount
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1	28	28	0	12Gx1-1/4x10'PnchAng	m052919	0952098	1,073.0000	300.44 G
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## Split-loom

Split loom for protecting the sensor cables from sun, trampling, rodent bites, etc has been ordered from FlexiblePVC.net. It is hard to say if this co. will be around long term as their website is ambiguous about closing. Receipt from 2019 for MVG is below.



Thank you for your order. Your order number is 19914, placed 08/22/2019 at 06:18PM.

**Bill To:**

University of New Mexico  
Tayli Larreategui  
MSC 03 2020 BIOLOGY  
1 University of New Mexico  
Albuquerque, NM 87131  
United States  
5052772742  
tlam@unm.edu

**Ship To:**

University of New Mexico  
Anthony Luketich  
219 Yale Blvd. NE  
Castetter Hall RM 1480  
ALBUQUERQUE, NM 87131  
United States  
5052772742

**Payment Info:**

**Credit Card:** Visa  
Tayli Larreategui  
\*\*\*\*\*8846

**Shipping Method:**

Ground Service

**Order Details:**

Code	Item	Qty	Price	Grand Total
Split-Tubing-PVC-B-1x100	Flexible PVC Split Tubing - Corrugated - Black - 1.00" dia x 100 ft	10	\$69.99	\$699.90
				Subtotal: \$699.90
				Tax: \$0.00
				Shipping Cost: \$100.00
				Grand Total: \$799.90



## **References**

- Gherardi, L. A., & Sala, O. E. (2013). Automated rainfall manipulation system: a reliable and inexpensive tool for ecologists. *Ecosphere*, 4(2), 1–10. doi:10.1890/es12-00371.1
- Yahdjian, L., & Sala, O. E. (2002). A rainout shelter design for intercepting different amounts of rainfall. *Oecologia*, 133(2), 95–101. doi:10.1007/s00442-002-1024-3