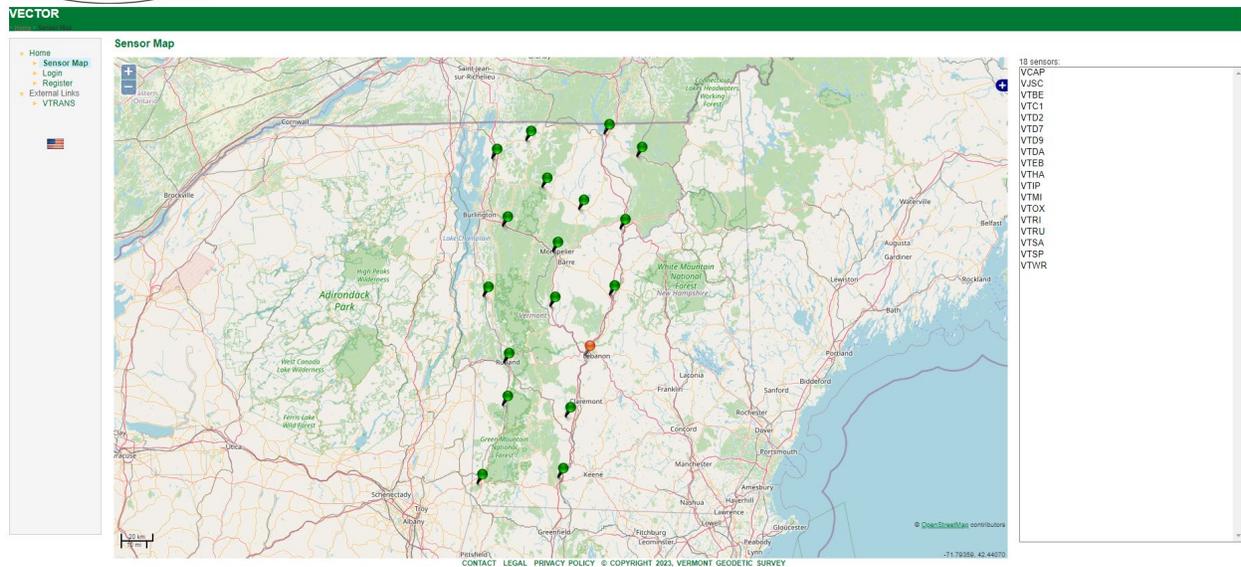


## **VermontCORS Rover 900Mhz with Internet VRS:**

[VECTOR - Welcome \(vermont.gov\)](#)

[CORS | Agency of Transportation \(vermont.gov\)](#)

[Vermont Real-time | Agency of Transportation](#)



## Vermont Real-time

The Real-time Correction component of VECTOR is offered to you, the user as a public service. Use of this site and the information presented is subject the user's agreement to the connection terms and conditions set forth below.

Connection to this network is not guaranteed. There may be times when this data is unavailable due to system limitations or network outages.

In the preparation of this correction broadcast service, VTrans has endeavored to offer current, correct, and clearly expressed information. Nevertheless, errors may occur. VTrans expressly disclaims any liability, of any kind, or for any reason, that

might arise out of any use of the correction information broadcast provided by this service. In particular, but without limiting its disclaimer, VTrans disclaims any responsibility for typographical errors or inaccuracies of the information provided or contained within the broadcast message. VTrans makes no warranties or representations whatsoever regarding the quality, content, completeness, suitability, adequacy, sequence, accuracy, or timeliness of the information and data provided by this service. VTrans makes no warranties or representations of any kind regarding this service that may serve as the basis for holding VTrans and/or the State of Vermont liable, under any circumstances, for any consequence of the use of this information contained in the correction broadcast message. VTrans makes no warranties or representations regarding the condition or functionality of this broadcast service, its suitability for use, or that this broadcast service will be uninterrupted or error-free.

Real-time corrections are available from VECTOR under the following conditions:

- Connections from field receiver to network must be made through the Internet.
- User authentication will make use of NTRIP (Network Transport of RTCM via Internet Protocol): A secure login (Username, Password) is required. Users must “register” to use this service by filling in and submitting the on-line registration.
- Field receiver must have NTRIP communication ability.
- Single base data streams are transmitted in RTCM version 3.1. VRS data streams are transmitted in RTCM 3.1 and CRM Plus.

RTK correction data is obtained by connecting to a specific IP address, port, and mountpoint. Note that the mountpoint is case sensitive. For instance, if one were to request corrections from station Bradford, the connection string would be 20.185.11.35:2101/VTOX\_RTCM3. However, if users input simply the IP address and port, the user should be presented with the “Source Table” which is the list of available mountpoints. The user can then just select the mount point from the list.

All connections are made through 20.185.11.35 port 2101.

## Services

STATION	ID	MOUNTPOINTS	LOCATION	TYPE	FREQUENCY
Bennington	VTBE	VTBE_RTCM3	Bennington Fire Station	GPS+GLONASS	L1/L2
Bradford	VTOX	VTOX_RTCM3	Oxbow HS	GPS+GLONASS	L1/L2
Danby	VTDA	VTDA_RTCM3	Currier Memorial School	GPS+GLONASS	L1/L2
Derby	VTD9	VTD9_RTCM3	Dist. 9 Garage	GPS+GLONASS	L1/L2
Dummerston	VTD2	VTD2_RTCM3	Dist. 2 Garage	GPS+GLONASS	L1/L2
Enosburg Falls	VTEB	VTEB_RTCM3	Enosburg Maint. Garage	GPS+GLONASS	L1/L2
Hardwick	VTHA	VTHA_RTCM3	Hazen Union High School	GPS+GLONASS	L1/L2
Island Pond	VTIP	VTIP_RTCM3	Island Pond Dist. Garage	GPS+GLONASS	L1/L2
Johnson	VJSC	VJSC_RTCM3	Johnson State College	GPS+GLONASS	L1/L2
Middlebury	VTMI	VTMI_RTCM3	Middlebury Middle School	GPS+GLONASS	L1/L2
Randolph	VTC1	VTC1_RTCM3	VT Tech. College	GPS+GLONASS	L1/L2
Rutland	VTRU	VTRU_RTCM3	Asa Bloomer Bldg.	GPS+GLONASS	L1/L2
Richmond	VTRI	VTRI_RTCM3	Camels Hump Middle School	GPS+GLONASS	L1/L2
Springfield	VTSP	VTSP_RTCM3	Springfield HS	GPS+GLONASS	L1/L2
St. Albans	VTSA	VTSA_RTCM3	BFA High School	GPS+GLONASS	L1/L2
St. Johnsbury	VTD7	VTD7_RTCM3	Dist. 7 Garage	GPS+GLONASS	L1/L2
Montpelier	VCAP	VCAP_RTCM3	133 State Street	GPS+GLONASS	L1/L2
White River Jct.	VTWR	VTWR_RTCM3	Dist. Court House	GPS+GLONASS	L1/L2
Network	VRS	VRS_RTCM3	Statewide	GPS+GLONASS	L1/L2
Network	VRS	VRS_CMRp	Statewide	GPS+GLONASS	L1/L2

# CORS

## Our Network

The VT CORS Network consists of 18 reference stations across the State. All stations, excluding VJSC and VTWR, are accredited with NOAA CORS Network (NCN) status. VTrans uses Trimble Pivot Platform software to configure and monitor the quality of data from the reference stations. This specialized software provides users with Real-Time Network (RTN/VRS) solutions in addition to the traditional single-base solutions. Users can access the raw GNSS data in multiple formats, epoch intervals, and data spans on the Vermont Enhanced CORS and Transmission of Real-time (VECTOR) corrections website.

Register for a [VECTOR User Account](#)

[View larger map](#)

## Equipment Replacement Plan

To ensure the longevity of this service, VTrans established a replacement plan for all reference station equipment in the VT CORS Network. This plan is a long-term, proactive solution that accounts for equipment life expectancy and keeps purchasing costs manageable.

Since 2018, VTrans updated seven reference stations with a Trimble Alloy GNSS Reference Receiver – the current replacement model. As of the Fall of 2021, three Trimble NetR5 receivers remain in use. These older units were purchased from 2006-2009 and are reaching, or exceeding, the expected lifespan of 7-10 years. It is our goal to replace the NetR5 units with the current replacement model by the end of 2023. The remaining seven stations utilize the Trimble NetR9 receiver model, all purchased from 2009-2018. All NetR9 units will start being replaced with the current model starting in 2024. This plan guarantees that by the beginning of 2025, all receivers will be less than ten years old.

Currently, station antennas are replaced at the time of failure.

[Approximate Equipment Costs\\*](#)

Trimble Alloy GNSS Reference Receiver: \$15,000

Trimble Zephyr Geodetic 3 Antenna: \$3,000

*\*Actual costs may vary depending on available equipment trade-in promotions*

## Receiver Purchasing Plan By Year

2021: \$45,000 (3 Receivers)

2022: \$45,000 (3 Receivers)

2023: \$45,000 (3 Receivers)

2024: \$45,000 (3 Receivers)

## Info

### General Information

The Geodetic Survey Section of the Vermont Agency of Transportation maintains a network of Continuously Operating GNSS (Global Navigation Satellite System) Reference Stations (**CORS**). These stations are intended to operate 24 hours/day seven days/week.

There are two separate components to VECTOR: Downloadable Data for post-processing and [Real-Time Corrections](#) to support real-time applications

### Downloadable Data

The data from these stations are made freely available to users and are downloadable from this web site.

These receivers collect data from the GPS, GLONASS, and GALILEO satellites - see the mountpoint table at [Vermont Real-Time](#) for specific details. Data files for these stations are available in Trimble's DAT, TGD, T01, and T02 formats as well as in the Receiver INdependent EXchange Formats (RINEX) versions 2.10, 2.11, and 3.02. Data

for the CORS stations is collected at 1-second epoch intervals, and can be retrieved in various epoch intervals ranging from 1 to 60 seconds.

## Reference Frame

As of February 15, 2013, the Vermont CORS are referenced to NAD 83(2011) epoch 2010.00. These coordinates are employed for all data products, both raw and real-time.

## Note on File Formats and Satellite Observables

The Trimble DAT files do not contain GLONASS observations and are compatible with both older and newer Trimble software. The RINEX files written in RINEX version 2.10 and 2.11 do contain GLONASS observations. User's software should recognize the GLONASS data and use it if GLONASS data was collected by the user. Also, the users' software should ignore the GLONASS data in a RINEX file if the software is not compatible with GLONASS observations.

## File Naming

The data file naming convention is as follows:

{ssss}{ddd}{h}{t}; where ssss is the four character site identifier, "ddd" is the day of year, "h" is a letter which corresponds to an hour long UTC time and "t" is the file type. For hourly files, the format would be {ssss}{ddd}{h}.(dat, tgd, t01, t02)

The RINEX file naming convention is as follows:

{ssss}{ddd}{h}. {yy}{t}; where ssss is the four character site identifier, "ddd" is the day of year, "h" is a letter which corresponds to an hour long UTC time block, "yy" is the year and "t" is the file type. For hourly files, the format would be {ssss}{ddd}{h}. {yy}o.

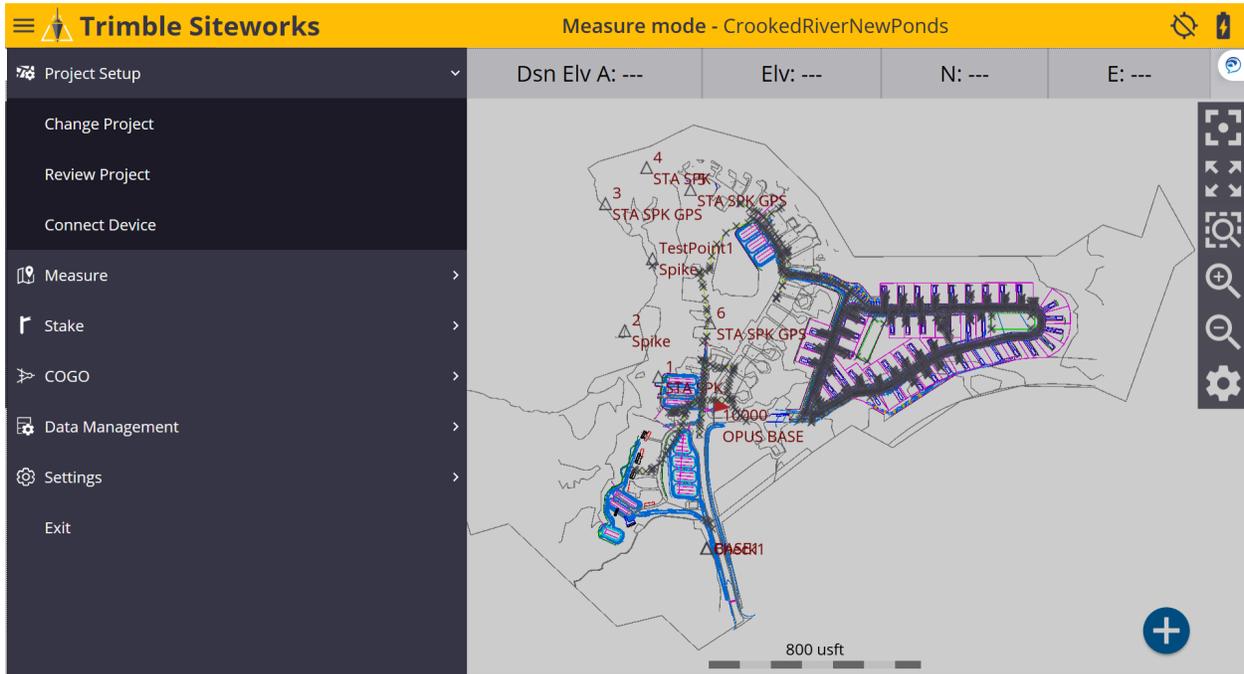
Hour long UTC time block identifier (h):

Time	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
ID	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x

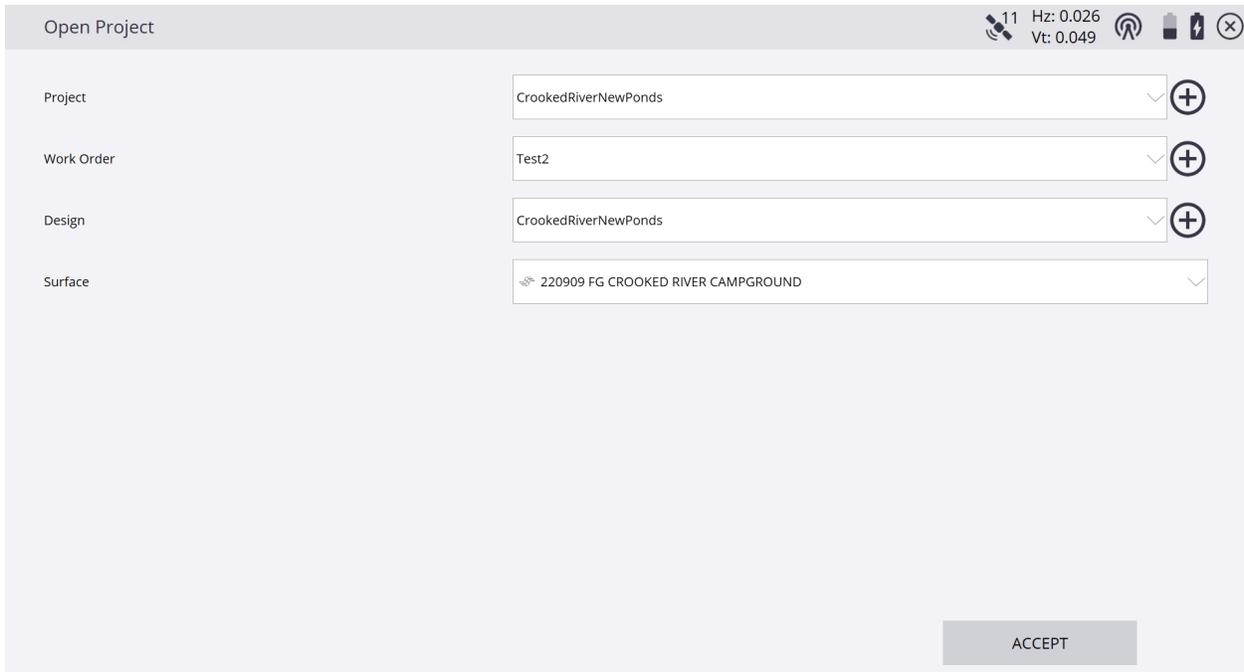
## Data Storage Policy

Data files are currently available online for at least 45 days, after which they will be deleted. Data is not archived prior to deletion and is therefore unrecoverable from this site. Users are encouraged to download data as soon as practicable. However, all data collected from the Vermont CORS that are part of the National CORS Network are available from the [NGS CORS](#) Page.

\*On the Siteworks upper left main screen tap the **3-Bar Hamburger Icon** and select **Project Setup>Change Project**.



\*Tap the + (*plus sign*) to the right of the **Project** window to create a new project.



\*Name your new project in the **Project** window, select the preferred project unit settings from the drop-down lists in each window, tap **NEXT**.

The 'New Project' window has a title bar with a close button. It contains several settings:

Project	VermontCORS
Distances	US Survey Feet
Angles	Degrees
Coordinate order	P, N, E, Z, D
Grid coordinate	North and East
Azimuth	North
Stationing	0+00.000

A 'NEXT' button is located at the bottom right of the window.

\*On the **Project Creation Options** screen, check the box next to **Select coordinate system** to use a coordinate system, tap **COORDINATE SYSTEM**.

The 'Project Creation Options' window has a title bar with a back arrow and a close button. It contains several options and settings:

- Select control point file
- Style guide: Siteworks Default
- File name (.CSV): Tap to select file
- Select FXL file: Siteworks Default.fxl
- Select coordinate system: **COORDINATE SYSTEM** (button)
- Coordinate system: United States/NAD83
- Zone: Vermont 4400
- Geoid: GEOID18 (Conus)

A 'FINISH' button is located at the bottom right of the window.

\*On the **Select Coordinate System** screen, select the desired Coordinate System, Geoid and Zone, tap **ACCEPT**.

Select Coordinate System

Coordinate system United States/NAD83

Zone Vermont 4400

Geoid file GEOID18 (Conus) [g18us.ggf]

ACCEPT

\*Once back to the **Project Creation Options** screen, tap **FINISH**.

Project Creation Options

Select control point file

Style guide Siteworks Default

File name (.CSV) Tap to select file

Select FXL file Siteworks Default.fxl

Select coordinate system

COORDINATE SYSTEM

Coordinate system United States/NAD83

Zone Vermont 4400

Geoid GEOID18 (Conus)

FINISH

\*Once back to the **Open Project** screen, tap the + (*plus sign*) and create a new **Work Order**.

Open Project

Project VermontCORS +

Work Order (Create New Work Order) +

OK

\*After naming the **Work Order**, create **Instructions** in the **Instructions (optional)** window to reference the work order, tap **FINISH**.

New Work Order

Work Order VermontCORS

Instructions (optional) Using Geoid 18

FINISH

\*Tap + (*plus sign*) to create a new **Design** or use (No design needed). For this demonstration we are not using a design, tap **ACCEPT**.

Open Project

Project VermontCORS (+)

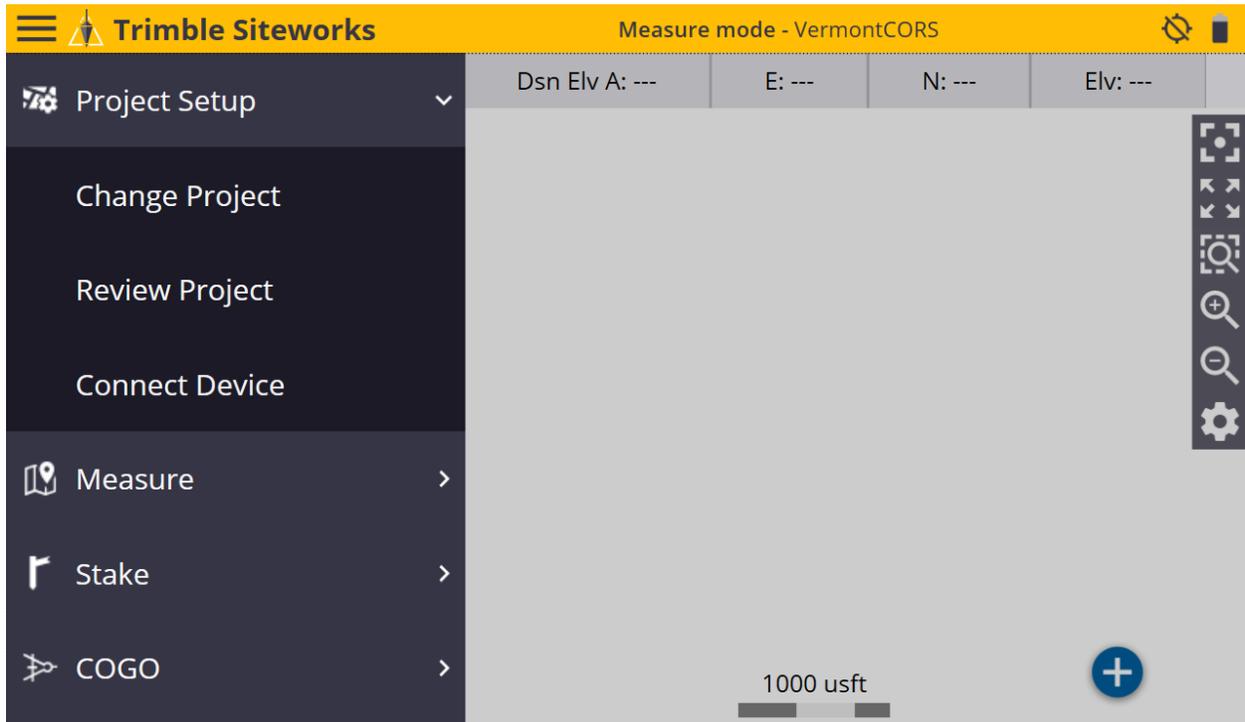
Work Order VermontCORS (+)

Instructions Using Geoid 18

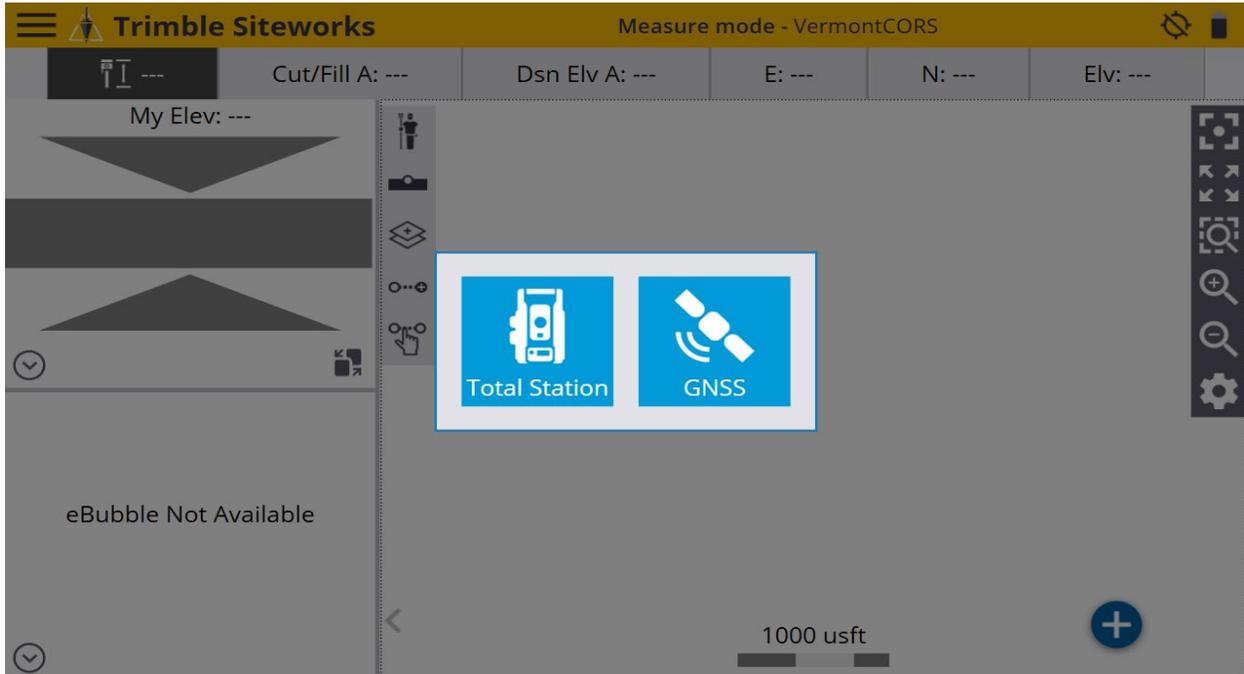
Design (No design needed) (+)

ACCEPT

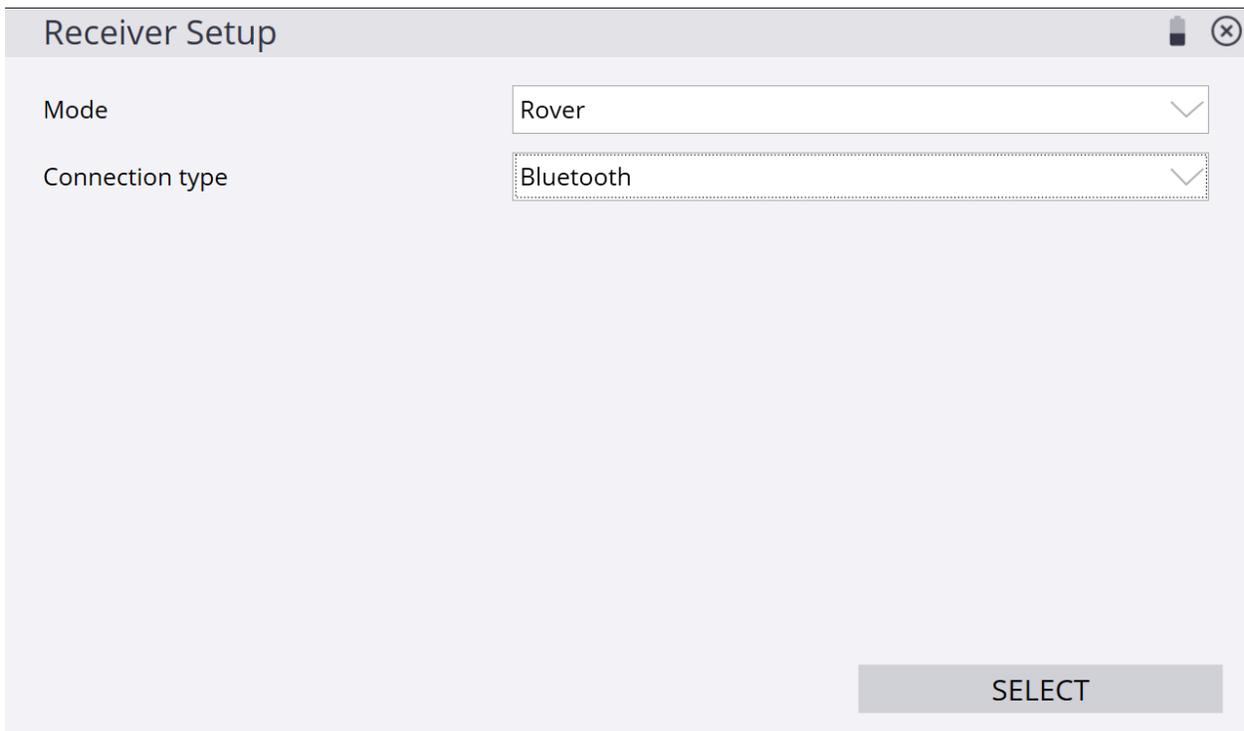
\*From the Siteworks upper left main screen tap the **3-Bar Hamburger Icon** and select **Connect Device**.



\*In **Connect Device** tap on the blue **GNSS Icon** to enter **Receiver Setup** screen.



\*On the **Receiver Setup** screen select **Rover** from the drop-down list in the **Mode** window, then select **Bluetooth** from the drop-down list in the **Connection type** window.



\*Next, select the Rover from the drop-down list in the **Bluetooth device** window.

Receiver Setup

Mode	Rover
Connection type	Bluetooth
Bluetooth device	R780 6229F00329 Trimble
Correction method	Internet

SELECT

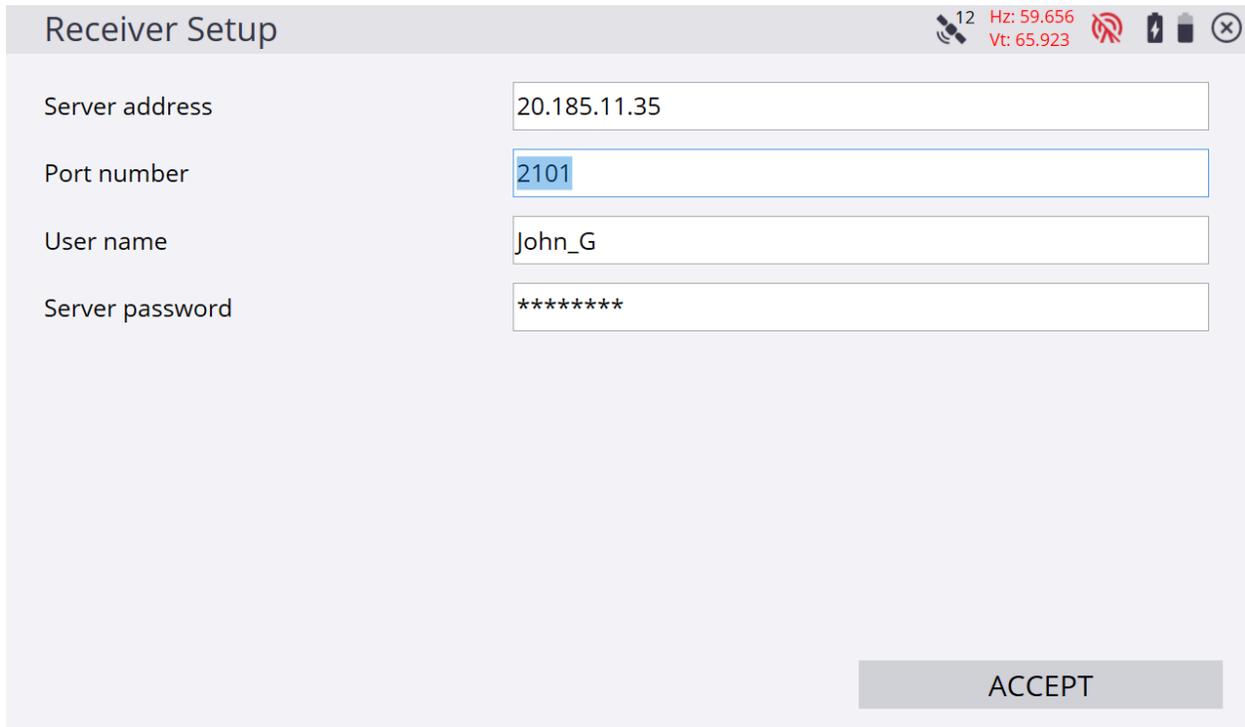
\*Next, select **Internet** from the drop-down list in the **Correction method** window and tap **VRS connection settings** in the **VRS connection settings** window.

Receiver Setup

Mode	Rover
Connection type	Bluetooth
Bluetooth device	R780 6229F00329 Trimble
Correction method	Internet
VRS connection settings	VRS connection settings

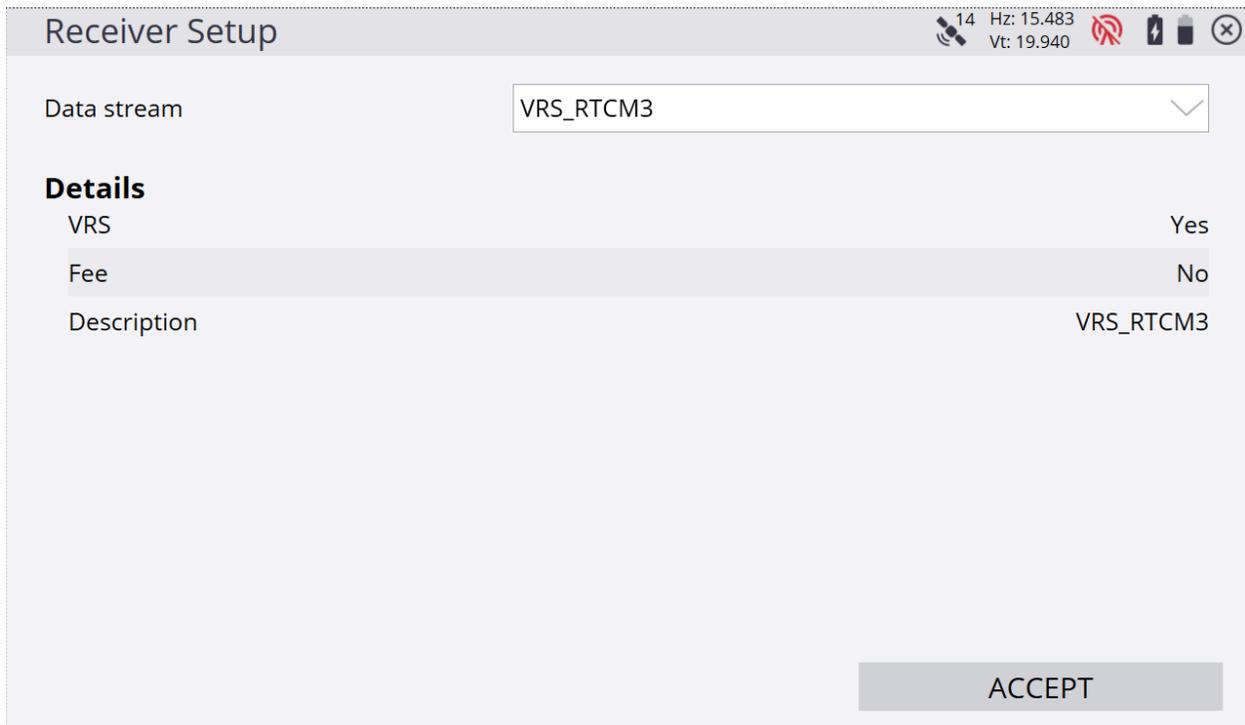
SELECT

\*On the **Receiver Setup Server** screen, input the **IP Server address**, **Port number**, **User name** and **Server passwords** into their corresponding windows.



The screenshot shows a mobile application window titled "Receiver Setup". The top status bar displays signal strength (12), frequency (Hz: 59.656), vertical speed (Vt: 65.923), and icons for Wi-Fi, battery, and a close button. The main content area contains four input fields: "Server address" with the value "20.185.11.35", "Port number" with "2101", "User name" with "John\_G", and "Server password" with "\*\*\*\*\*". A grey "ACCEPT" button is located at the bottom right of the window.

\*On the **Receiver Setup** screen select the desired **Data stream** for the VRS connection from the drop-down list in the **Data stream** window, tap **ACCEPT**.

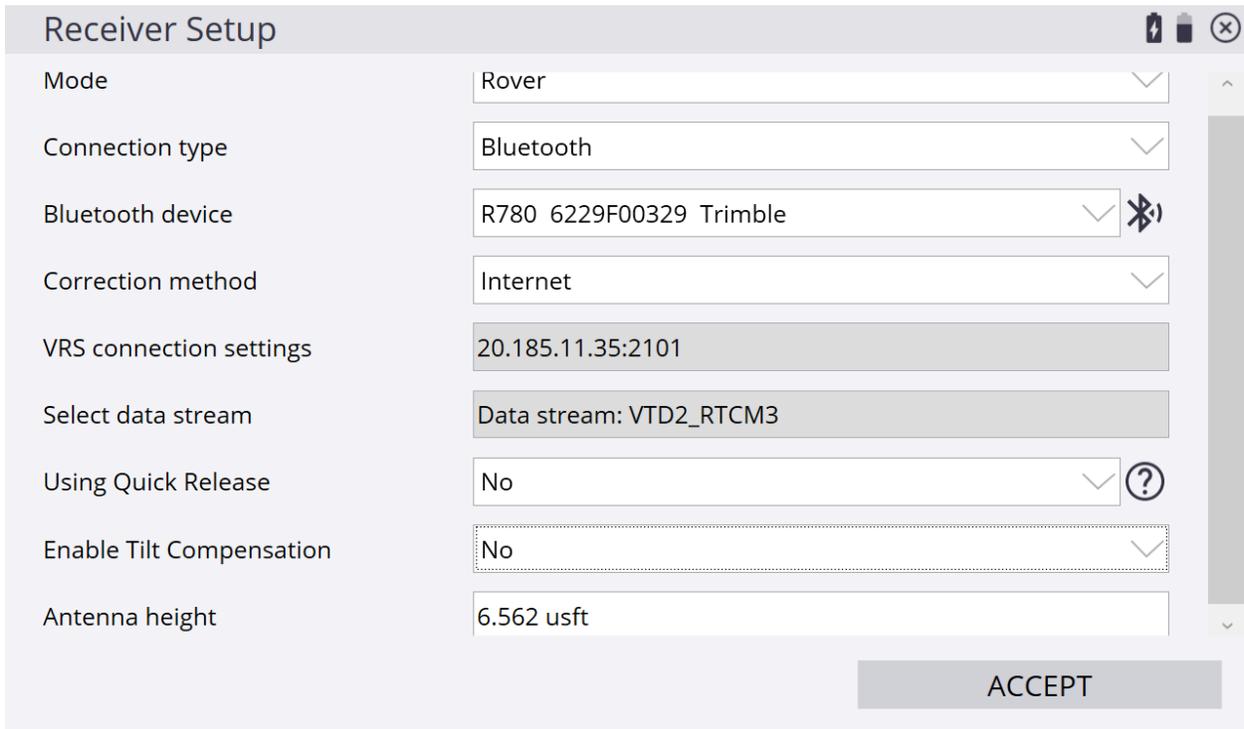


The screenshot shows the "Receiver Setup" screen with the "Data stream" dropdown menu open, displaying "VRS\_RTCM3". Below this, a "Details" section is visible, containing a table with the following information:

Details	
VRS	Yes
Fee	No
Description	VRS_RTCM3

A grey "ACCEPT" button is located at the bottom right of the window. The top status bar shows signal strength (14), frequency (Hz: 15.483), vertical speed (Vt: 19.940), and icons for Wi-Fi, battery, and a close button.

\*On the **Receiver Setup** screen select the additional settings for the VRS connection from the drop-down lists in their windows, tap **ACCEPT**.

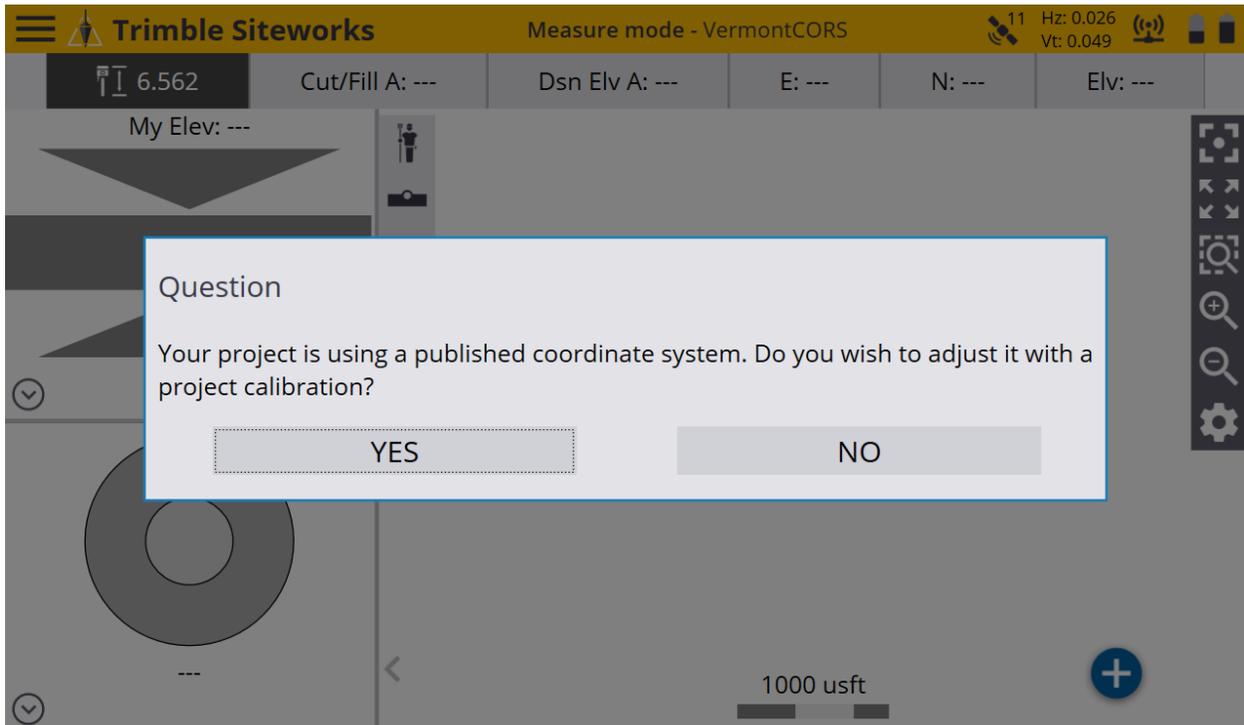


The image shows the 'Receiver Setup' screen in a mobile application. It features several configuration options, each with a corresponding input field or dropdown menu. The options are: Mode (Rover), Connection type (Bluetooth), Bluetooth device (R780 6229F00329 Trimble), Correction method (Internet), VRS connection settings (20.185.11.35:2101), Select data stream (Data stream: VTD2\_RTCM3), Using Quick Release (No), Enable Tilt Compensation (No), and Antenna height (6.562 usft). A large 'ACCEPT' button is located at the bottom right of the screen.

Mode	Rover
Connection type	Bluetooth
Bluetooth device	R780 6229F00329 Trimble
Correction method	Internet
VRS connection settings	20.185.11.35:2101
Select data stream	Data stream: VTD2_RTCM3
Using Quick Release	No
Enable Tilt Compensation	No
Antenna height	6.562 usft

ACCEPT

\*Siteworks asks if you want to adjust your project with a calibration, tap **NO**.



The image shows the Trimble Siteworks interface. At the top, there is a header with the logo and 'Measure mode - VermontCORS'. Below the header, there are several data fields: '6.562', 'Cut/Fill A: ---', 'Dsn Elev A: ---', 'E: ---', 'N: ---', and 'Elev: ---'. A dialog box is overlaid on the screen, asking 'Question: Your project is using a published coordinate system. Do you wish to adjust it with a project calibration?'. The dialog box has two buttons: 'YES' and 'NO'. The background shows a 3D model of a site with a scale bar indicating '1000 usft'.

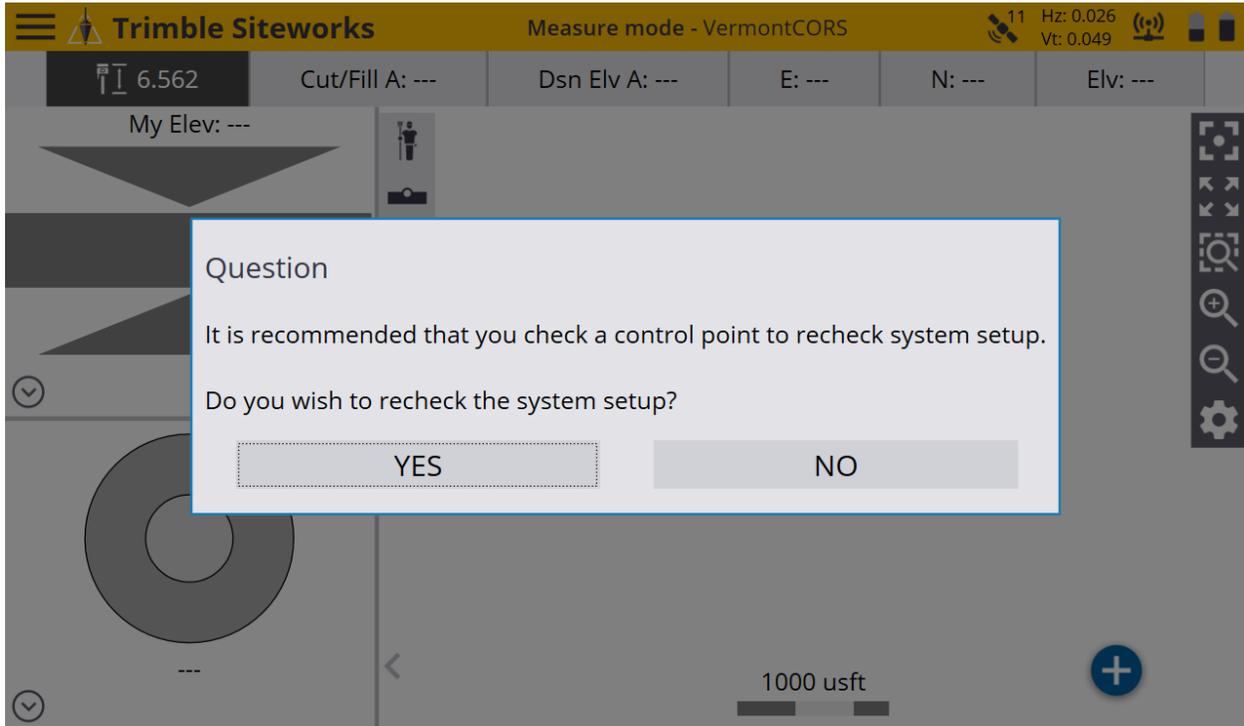
Question

Your project is using a published coordinate system. Do you wish to adjust it with a project calibration?

YES NO

1000 usft

\*Siteworks asks if you want to recheck the system setup, tap **NO**.



\*Once back to the main Siteworks screen you may start working.

