

Case Number 31158671 Memorandum of Information - Road Weather Information System (RWIS)				
Question no.	Chapter	Page	Question	Answer
1	Chapter 2. Scope of RWIS project	5	Does RWS want to have a camera offered as an option on the road condition monitoring system?	Yes, Although this is a description of the current RWIS system we use. For the future, we want a camera as an option to our RWIS systems, this will also be included in the list of requirements during the Tender.
2	Chapter 2. Scope of RWIS project	5	Which parameters need to be measured with embedded sensors, which one with non-invasive sensors? Is a compact weather station an option instead of a “weerhut”.	For now we are thinking of using the MOSCOW method for the requirements during the Tender. This means that we will describe the different parameters we want to measure. We will also describe what type of sensors we are thinking about. Each requirement has a category like Must, Should, Could or Nice. The Must haves are requirements that we absolutely need, for the others you can get points in quality. A few examples of these requirements are given in chapter 2.1 of the Marktconsultatiedocument.
3	Chapter 2. Scope of RWIS project	5	Would a “simple” sensor station (no sprayer etc.) would still have to be equipped with an RWIS controller ? Or a modular design that allows adding the controller later if the additional functionality is required at the site would be acceptable (since this modular design would allow to reduce costs...)	No, There are only three locations with a sprayer installation. The requirements only apply for those locations. We didn't decide what will be the basic, standard or plus configuration of an RWIS station. If you mean a RWIS controller for air temperature and humidity, these sensors will be needed in all configurations. A modular design is what we would prefer. A 'simple' sensor station that fits the needs and is part of a modular design of the COTS product will not need an RWIS controller as long it fits the needs. Rijkswaterstaat prefers a modular design where functionality could be added. Furthermore, Rijkswaterstaat prefers Commercial off-the-shelf (COTS) products.
4	Chapter 2. Scope of RWIS project	6	Stand-alone means not connected to the power grid? Is it allowed to use a combination of Solar-energy and a fuel cell?	Yes, stand-alone means not connected to the power grid. It is allowed to use a battery, wind, etc. You are welcome to come up with ideas. We asked three different setups of which at least one of the three setups has to be stand-alone.
5	Chapter 2. Scope of RWIS project	6	What will be the sample frequency and how often should the data be transferred to the central station?	The current RWIS system refreshes the data every 5 minutes to the GUI. This is the minimum. What could be an out-of-the-box solution? We want to avoid customization of the product and prefer standard functionalities that suits our needs. At this stage, we still welcome other suggestions.
6	Chapter 2. Scope of RWIS project	6	What is the communication protocol or output of the current sensors?	We prefer a flexible system that can handle various protocols and sensor techniques. We have no objection if components are added to connect sensors, as long as these components are part of the offered scope of delivery and integrates within the standard product.
7	Chapter 2. Scope of RWIS project	6	What is the interface with the existing systems and in what period will RWS replace the existing sensors? Who will be responsible for the maintenance and support on this part of the new system during this period?	RWS will replace all stations by a new RWIS station over time. We expect to achieve this within the coming four to five years. That will depend on usability, cost of maintenance, state of the station and cost of the new RWIS station. With this market consultation RWS intend to gather information as input for a Tender. So if we Tender the new stations together with maintenance of the new and old stations, the responsibility would be with the party that wins the Tender. We are open for suggestions to do it differently or other points we should consider. As stated, we want to learn what is possible and what not. RWS understands that more details are needed to realize a service. In this phase we are looking for a good strategy and for contractors who can support us. What strategy can you offer that would make us as a satisfied customer? What is your unique selling point?
8	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E1–E4: What is meant by Accuracy, we use Resolution?	We made a translation mistake, we do mean resolution. For the Tender we will change the terminology.

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9	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E5-E9: Is it allowed to use a separate solution to configure and maintain the stations?	It is basically not allowed to use a separate solution to configure and maintain the stations. Two aspects could be mentioned: - Security - Life-cycle of coupled system Security The interfaces must be safe and meet the safety requirements set by the our government, RWS is no exception here. Furthermore, the solution must be able to function in the RWS network and beyond. The set of requirements help to implement the requirements with the simplest possible solution. Maintenance and management interfaces can have a greater impact on security issues and should therefore certainly meet the requirements. Life-cycle of coupled systems (Loosely Coupled) As mentioned, RWIS should also be able to maintain and configure other (minimum of 5) systems, therefore a separate solution would make it unnecessarily complicated. One of the aspects of loosely coupled systems is that life-cycle management of all connected systems are separated and can change with minimal impact in the whole system. Of course we are open to ideas and suggestions, no matter how the RWIS will be integrated in a larger system.
10	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E5-E9: This refers to the interface/API that has to be provided by the RWIS station (system)? What exactly do you mean by “manage” ? Does this refer to things like rebooting, remotely	By 'manage' Rijkswaterstaat means the process of creating, changing, updating up to removal of the configuration of the device. Controlling sprayers is for example part of the configuration that should be 'managed'.
11	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E.13: The document says maintenance is included in the scope. Does E.13 mean that maintenance will be done by a 3rd party not being the contractor necessarily?	This has not been decided yet. It will depend on the answers we receive, that is why we start with this market consultation. In the scenario that the supplier of the RWIS system isn't the maintenance partner, or a situation that the contract terminates and we need a new partner, we need this requirement. RWS sets great store by being totally unburdened.
12	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E.15: What does this mean, is it required that 5 people simultaneously can work on the (configuration) of the station?	By 5 clients we mean 5 different API connections at different applications. As mentioned before: the scope of the API includes the management and maintenance associated with new RWIS stations. This requirement implies that the RWIS system can be configured and managed by more than one main system, underlying requirements are redundancy and high availability aspects of central systems and further development of central systems, for example, backup systems and new main system(s).
13	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E15: We would assume by “Clients” you refer to the protocol – a “client” in terms of HTTPS etc. would be e.g. the central station utilizing the interface (E6.....) to access the RWIS station. So do you require that the station can be polled from multiple sites simultaneously?	By 'manage' Rijkswaterstaat means the process of creating, changing, updating up to removal of the configuration of the device. Controlling sprayers for example, are part of the configuration that should be 'managed'. We require that the stations can communicate with multiple systems simultaneously. We also require that the configurations of the stations are stored and are accessible for other systems. Rijkswaterstaat prefers a Service Oriented Architecture (SOA) in which loosely coupled systems is one of the aspects to create systems that are able to serve our internal and external users.
14	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E16: so a “Client” could also be something like a “service program” that must be provided ? What do you mean by “with support for integration” ? Where do you what to integrate that Client? It should be better specified what exactly you refer to by “Client” here	In the case of an RWIS, the RWIS fulfills the role of server because it serves other systems. The other systems with a minimum of 5 are clients of the RWIS. The client is a user of the service. The client is not in scope. The API of the RWIS must be complete and clearly defined so that any client that complies to this API can interoperate.
15	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E.18: This means the cabinet will need a heater, but in E17 this is not allowed? How does RWS sees this in combination with solar power during wintertime?	It could also be + 60. We need a good cabinet that can operate without a heater and still remain functional. If you think we are asking something impossible then tell us why and what you recommend for this requirement. We want a low-maintenance solution and the fewest possible visits to a location for maintenance and repair. That way we want to contribute to safety and maximum availability. We have had bad experiences with cabinet heaters and therefore we prefer not to use cabinet heating for conditioning a cabinet.
16	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E.21: Is it allowed to use a compact weather station instead of this shelter?	Yes, as long as it is in line with our requirements. What do you mean with compact weather station? And how do you guarantee the quality of such a weather station? Can we test it with our KNMI? They test and certify our shelters every year.
17	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E.26: Does this mean RWS wants to use multiple SIM cards, or a SIM card that can switch between multiple providers?	Either of those options is fine with us. As long as we do not depend on one service provider.
18	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E.27: Which type of sensors do you mean with what kind of output? Is it possible to connect these sensors by a bus structure?	We mean all types of sensors possible. Do you see problems regarding this requirement?
19	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E29 – E30: What sensor will be used, embedded or non-invasive ? It's not possible to measure road surface temperature with a non-invasive sensor within the specifications. mentioned under E.1 If a non-invasive sensor is used, should it be installed on the mast at the side of the road or on a portal above the road?	Requirement E.29 is embedded and requirement E.30 is not. We didn't specify requirements for non-invasive sensors in these examples. When we will publish the Tender we will add the complete list of requirements.
20	Chapter 4. Questions, Questions about the contract content	11	B9: How long does a system has to run without power/sun?	A requirement for the station is that it will never go down due to empty batteries. This is a good question - what would you recommend and what is possible?
21	Chapter 2.1 Requirements and wishes placed on the GMS measuring stations and sensors	5	E.4: Will an accuracy lower than 0.1 mm be allowed?	There may be a difference in accuracy between contactless and hardwired sensors, but we do not want an accuracy lower than 0.1 mm. Do you foresee any problems with this?

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22	Chapter 2.1 Requirements and wishes placed on the GMS measuring stations and sensors	6	E.25: Are more advanced technologies such as Lora and Sigfox allowed?	Technologies such as Lora and Sigfox are permitted provided they meet the quality requirements and standards. As long as it doesn't create a Vendor lock, RWS are interested in the possibilities.
23	Chapter 2.1 Requirements and wishes placed on the GMS measuring stations and sensors	6	E.26: Is backup communication a hard requirement?	Yes, it is a hard requirement as this is a decision support system for us and we demand a high level of reliability. Backup, or more precisely, high availability is a hard requirement for the total weather information system (RWIS). For measuring stations, this means that they must be suitable to be addressed by multiple clients because the set up of these clients may be redundant.
24	Chapter 2.1 Requirements and wishes placed on the GMS measuring stations and sensors	6	E26: Are these 28 different types of sensors or 28 of the same type?	This depends on the type of sensors being connected. So we ask for the possibility to connect 28 sensors. These may be partly the same but also different ones. For example, road surface temperature sensors, conductivity, air temperature, relative humidity, road surface status, etc. These can be either hardwired or contactless sensors.
25	Chapter 2.1 Requirements and wishes placed on the GMS measuring stations and sensors	6	E.26: What kind of sensors are these?	These may be sensors for road surface temperature, conductivity, air temperature, relative humidity, road surface status , etc. They may include either hardwired or contactless sensors.
26	Chapter 1.1 Background GMS	3	In the 4th paragraph you mention the "RWS Partner Programme". What exactly does the RWS Partner Programme entail?	Rijkswaterstaat will act as a central purchasing body (the contracting authority). This means that other authorities may join in with this tender.
27	Chapter 1.1 Background GMS	3	In the 4th paragraph you mention the "RWS Partner Programme" and the related expectation that RWS will play a greater role in the national winter maintenance and support system and that other parties will also participate in the use of the future GMS. What parties is RWS referring to in this case?	We already have a large number of Provinces taking part and we expect that more Provinces and major road authorities may want to take part. Initially it is about the major road authorities, but it is also possible to involve local road authorities.
28	Chapter 1.1 Objective, item 3	3	Can you describe more precisely what you mean by "3. Meeting the changing needs of RWS and partners with regard to GMS."? The document does not describe this needs explicitly.	That is right, changing needs are not explicitly described. Rijkswaterstaat expects changing needs and is looking for systems that can adjust to these changing needs. Defining these needs will inadvertently make the systems rigid while we prefer flexibility and agility. Changing needs may for instance include new/different measuring values that we did not measure until now. In this case for instance, water film height. We are not measuring this parameter at the moment. The changing need may also involve other types of sensors, other power supplies or things we have never heard of before. Most of the changing needs will therefore be requested during the Tender procedure in the form of functional requirements.
29	Chapter 2.1 Requirements and wishes placed on the GMS measuring stations and sensors	5	E.3 Water film sensor: Why do you consider a water film road surface sensor necessary for the quality of a winter maintenance and support system? We think it can be calculated more accurately on the basis of other available data, than it can be measured by a road surface sensor. The reliability of the water film road surface sensor is questionable because the measuring position can give values that are non-representative of the road section and the measurement cannot give a reliable level of precipitation. Is RWS willing to consider dropping this sensor as a requirement?	We intend to categorize the functional requirements during the Tender procedure using the MOSCOW (MOSCON) method. This may mean that not all sensors are a "Must" have. We don't intend to drop this requirement. The reason that we are asking for this requirement is not to throw existing measurements/techniques overboard, but rather as an addition in order to get a better picture in certain situations. We are aware that not all sensors/measured values we are asking for are reliable in all situations, but we do think that combining measurement data in certain situations is an added value.
30	Chapter 3.1.5 Verbal explanation to questionnaire	8	On the basis of which grounds/criteria does RWS determine whether and, if so, which parties will be invited "to give a supplementary verbal explanation to their replies on a one-on-one basis"?	If, after the market consultation, essential information still appears to be lacking, RWS will want to discuss this with all interested parties. In the scenario that the number of interested parties turns out to be so large that the project group cannot talk to all parties within a reasonable period of time, the project group will choose the parties on the basis of the answers given. All information retrieved will be made available in the tender documents.
31	Chapter 4. Questions	10	B5: can you indicate which third-party sensors you are referring to and what type of data communication is required?	We mean any sensors from a different party than the one that wins this Tender. At this moment we do not foresee which sensors are involved and, therefore, not which type of data communication either.
32	Chapter 4 Questions	10	B6: can you explain what 'information chains' you refer to?	Information chains are operational, management and configuration information chains. In these processes the API(s) of the weather station are used by one or more central systems. In what way should the APIs be applied and does it make special demands on the central systems?
33	General question	n.a.	How often are roads typically resurfaced in the road network in the Netherlands?	It depends on the type of asphalt and traffic intensity. Assume between 5 and 13 years.
34	General question	n.a.	What are the typical expenses maintaining / exchanging / installing embedded sensors including traffic management cost in the Netherlands?	Many different variations are possible to give an average indication.
35	General question	n.a.	What is typical yearly expense (e.g. per station) for maintaining the existing RWIS network in the Netherlands?	See reply to question 34.
36	General question	n.a.	How often do you calibrate as today the humidity measurement sensors?	These sensors are calibrated once a year.
37	General question	n.a.	Who is (like a contractor/manufacturer) is calibrating the humidity measurement sensors?	Calibration is done by our national weather institute KNMI.
38	General question	n.a.	Are they any specific requirements for traceability or quality standards the calibration process must fulfil?	This is to be decided at a later moment in the process
39	General question	n.a.	What is your policy for lane-specific measurement (temperature, residual salt, layer thickness etc.) now and in the future?	Currently, we measure road temperature, conductivity and the road body. But the road body temperature is optional. For the future we also want to measure residual salt, layer thickness and road condition. In the Netherlands we usually measure within the left-hand wheel track.
40	General question	n.a.	How is the embedded sensor wiring typically installed for cases where there are multiple sensors connected to a one station (e.g. cases 10+ sensors). Are tubes used, how are wires installed, how long are cables typically? Are individual wires or e.g. multi pair VMOHBU telecommunication cables used or all having individual wiring?	The following is the general current situation. You are invited to come up with solutions that improve quality and costs. Each embedded road sensor is connected by its own wire to a station. The wires and sensors are embedded and sealed in asphalt in the saw cut. Wires of sensors in the opposite carriageway are combined between the carriageways in a connection box. A multiple wire cable under the road connects the box to a station. A connection box is also used in other situations like in situations with sensors in a crossing road or junction. Sensor wires/cables on bridges are in tubes. Sensors in asphalt on bridges are sometimes placed in pots. These tubes and pots are generally the responsibility of the party that maintains the bridge. The cables can be as long as 300 meters.,

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41	Chapter 2.1 Requirements and wishes placed on the GMS measuring stations and sensors	6	E.1, E.2, E.4: Is the term "Accuracy" actually "resolution" you are referring to? And is "reliability" actually "accuracy"? We assume this terminology is related to translation of the documents from Dutch to English.	We made a translation mistake, we do mean resolution and accuracy. For the Tender we will change the terminology.
42			What is your estimate how many of the stations are planned to be solar powered without presence of mains voltage?	We haven't really mapped the exact number yet, this depends on the reliability of the solution offered.
43	Chapter 2.1 Requirements placed on RWIS stations and sensors	6	Are you envisioning to use more either embedded or remote sensing for surface temperature measurement? If remote temperature measurement - then specification E.1 "accuracy +/-0.2C is not achievable with the current remote surface sensor technology.	We are planning to use both, embedded and remote. The specifications will be separate for embedded and remote. They will be different. For the sake of this market consultation we only added some example requirements .
44	Chapter 4. Questions, Questions about the contract content	10	B.12: What are the asphalt types used in road network in the Netherlands?	Approximately 70% of the RWIS is placed in porous asphalt, the rest is placed in mainly non-porous asphalt
45	General question	n.a.	Are you aware of any specific phenomena / physical characteristics in relation to the porous asphalt the RWIS system provider should be aware of? E.g. aspects for installation, chemicals / filling material, or optical characteristics.	Rijkswaterstaat is aware of the fact that ZOAB (double-layered porous asphalt) is highly sensitive to icing.
46	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E.18: is your specification -40 to +80C referring to operating temperature or storage temperature. Or is it referring to enclosure or ambient temperature for station operation?	This refers to the outdoor temperature window within which the station still needs to function properly.
47	Chapter 2.1 Requirements placed on RWIS stations and sensors	6	In the section E.4 it is mentioned that the interface is required to utilize one of the following internet (IETF standard) protocols: Https or CoAPs. Please verify that it will be possible utilize both https and CoAPs as interface protocols as a part of the solution?	It is possible to utilize one or both interface protocols by implementing two separated APIs.
48	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	E.27: Could you please provide an example (documentation/physical installation drawing of conduits) of a typical "maximum like" installation where the 28 sensors are needed. With this information RWIS manufacturers can review the infrastructure how to optimize the setting / installation (like cable routing, combined sensors, system architecture).	If you use combined sensors, it isn't likely we need 28 sensor connections. If you look at our current situation, we use separate temperature sensors and they are paired in each lane. Also in each lane in some cases there are two conductivity sensors. If you have a lot of lanes, the numbers of sensors are getting high. We can provide a document with an example if needed. Each sensor has its own wiring.
49	Chapter 2.1 Requirements placed on RWIS stations and sensors	7	In the section E.15 the RWIS is required to be capable of being addressed simultaneously by a minimum of 5 clients. Does this mean minimum 5 simultaneous web client users accessing the system via their web browsers or minimum 5 simultaneous machine-to-machine (M2M) interfaces to be supported for communication with external data management or computing system applications?	We mean 5 simultaneous machine-to-machine interfaces are required to be supported for the purpose of communication. The RWIS does not have direct access to these interfaces. The RWIS will be integrated with other systems where a front end is used to interface with client users.
50	General question	n.a.	Can you indicate which sensors/observations are the most relevant as today for your winter maintenance, and traffic control (sensor / measurement). Please indicate for which purpose each of the parameter is the most relevant? What sensors/measurements you are seeking to implement in the future?	During the tender procedure, all requirements will be published with specifications regarding the types of sensors/parameters. We hope that during this market consultation you will indicate which parameters would be suitable for us.
51	General question	n.a.	What are the most likely potential improvements to the RWIS system in the Netherlands that would improve your quality of service, safety or cost efficiency the most?	We are looking forward to your advice and suggestions, given our mindset as explained in the previous document and these answers.
52	General question	n.a.	When could we expect that the final tender will be published to the market and what would be the language used in it?	It is difficult to estimate the date on which the final tender will be published. Although Rijkswaterstaat would like to start the tender as soon as possible, we aim to start in Q1 of 2021. Depending on the response to this consultation the language will be decided later in the process. It is quite possible that we also publish the tender in Dutch with an English translation. The documents in Dutch will always be leading.